JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Publicity.

An Appeal to the Whole Gas-Supply Industry.

THE Gas Publicity Movement is now well on foot; and it behoves one and all interested in the progress and development of the British Gas Industry to earnestly pledge himself and themselves to do everything in his and their power to crown the scheme with a conspicuous success. Although, in the circular on the subject that every chairman of every gas undertaking in the United Kingdom will have received, the militant side of the scheme has been kept strictly in the background, it is well known that it principally owes its inception to the aggressiveness and gross misrepresentation of competitors; and therefore the present circular may be taken as a call to arms, and a call to defence, on active lines such as circumstances, expedient and exigent—in the quiet ways of a general educational campaign, or the more thrilling expeditionary work in the causes of correction, resistance, and protection—may demand. We hope to hear of a response to the scheme and appeal now before us that will exhibit in true light the full appreciation of the gas industry as a whole of the position of the times—a position created (largely, though not entirely) by active competition, with a Publicity Committee in its midst supported and financed for extensive work by an industry that duly and fully acknowledges the potency of such an impersonal and independent representative agency. The work that lies before a Gas Publicity Committee is big with importance. It is a work that cannot be conducted in any narrow way; and it must be continuous and comprehensive. If each and all concerned see these things in this light, if each and all get animated with the spirit that should lie behind, should urge forward, and should be the motive force in publicity work of this kind, then the response will be on a scale that will make the newly-formed Committee powerful for much good in the time of present and future necessity. Half measures in their support will only mean half measures in the Committee's work, and that will be next to useless.

The Committee that the Institution of Gas Engineers have formed offer themselves for and in the service of the gas industry. It is a Committee whose services, offered freely, the gas industry cannot afford to reject. Reject the offer by indifference or withholding support and allegiance, and the chances are that much time will pass over our heads before a Committee of equal influence and fitness will again be brought together for this imperative purpose. It is a strong Committee in qualification and in representation; and it is a Committee the members of which command great respect, and can command effective service in the cause in hand. England, Scotland, Ireland, and Wales are all represented on it—no quarter of the country can plead neglect, no special conditions due to geographical situation have inadequate surveillance. Company and municipal undertakings (the Chairman of the Committee is Mr. Alex. Wilson, President of the Institution, and the Chief Engineer of the progressive Glasgow Corporation Gas-Works), large and small, have their interests voiced in the representation. A better Committee there could not be; and this Committee will keep watchful eye upon the Executive Committee that they themselves will appoint, with expert assistance, to direct the operations of the organization, and control the application of funds. Such an Executive Committee is an indispensable feature in an organization for propaganda effort and campaigning work for rapid movement and for effective procedure.

We will not discuss here the character of the work that it is proposed the Committee shall undertake. It is set out in the circular received by Chairmen of gas undertakings, and reproduced elsewhere in our columns to-day; and what is not printed there can by the sagacious be imagined. We see names upon the Committee appearing one after the other that are to us a sufficient guarantee of the comprehensiveness of the work that will be taken in hand. They are active, persistent, and shrewd propagandists individually in their own localities; and we await the proof of what they will be collectively, given a fair opportunity, with the fullest confidence. It is that "fair opportunity" that is our chief concern. A fair opportunity and an effective central organization for operation and information, mean much money; but the sufficient financing will be a light thing by mutual support. Let us see. The Committee suggest a yearly subscription for a minimum period of three years at not less than 2s. 6d. per million cubic feet of gas manufactured. That is a modest tax of 0·03d. per 1000 feet on the 193,547 million feet of gas made in 1909 by the statutory gas undertakings of the United Kingdom. Yet this 0·03d. per 1000 cubic feet amasses into £24,193 for the single year if all the statutory gas undertakings would adopt the suggested basis of contribution. Think of that. Think of the educational, advertising, expert popular writing (it must be in popular style), compilation, and information work such a sum would provide for, though it must be borne in mind that advertising on the large scale in the daily and popular weekly and monthly papers circulating throughout the country is not an inexpensive matter. But such a sum would protect and advance the commercial interests of the gas industry in the community, and this is the primary object of the project. It will be seen that the fund is to be associated with the Special Purposes Fund of the Institution, which will do away with the need for a special appeal for the latter, with the reservation that not more than 10 per cent. shall be devoted to special purposes to the behoof of the industry other than publicity.

We believe in the cause in hand; we believe in the Committee that has been brought together. It is therefore asked that the response to the circular shall have about it the attributes of spontaneity, enthusiasm, and industrial unity. It is, as the circular says, a movement "of benefit to all, "and proportionately to the magnitude of each; and it is "only equitable that all undertakings should bear their share "of the cost." Let it be so; and let it be remembered, too, that, as we go down in the scale of magnitude of undertaking, the competitive pressure increases, and inherent resources lessen in one way or another. The question of the abstention of the smaller undertakings in giving support does not arise. They have in this matter common lot with the larger ones; and there are common interests to be advanced and protected. Then let all undertakings—let none from pure selfishness or parsimony refuse to—rank themselves shoulder to shoulder in this matter; and let the Committee set out upon their work without further delay. The work is waiting.

Sulphate of Ammonia Changes and Compensations.

THE annual report of Messrs. Bradbury and Hirsch on the conditions of the sulphate of ammonia market during the past twelve months is not by any means discouraging to producers, though it indicates intransient changes in the course of things that to British gas undertakings cannot be regarded as altogether in their best interests as producers, though in accord with the laws of economic progress. It cannot be expected that, with advancing time, the sulphate of ammonia market should be less immutable than aught else in the world; but the report now under notice indicates that, though considerable changes have come over the market both in regard to production and geographical absorption, compensation has kept pace with the march from the old conditions. There is no reason to expect any diversion from this trend of events. In bulk, the fertilizer trade in 1910 beat all previous records; and with the expansion in the world's requirements for produce, and with increasing knowledge of the value of the application to the soil of nitrogenous fertilizers, there is no reason to anticipate that,

with the work going forward to create new demand and with experience, this will not continue. That is speaking generally. But there is also every reason to anticipate that sulphate of ammonia will stand well in the running, notwithstanding the resistance offered by the plentiful supply of nitrate of soda, the low price, the continued absence of combination to support prices, and the current higher price of sulphate of ammonia compared with a year ago.

The changes, so far as British producers are concerned, have been quantitative in regard to production, and geographical in regard to demand—production in other countries forcing home production to more distant lands, the absorptive power of which, it is believed, will be largely and continuously developed. It is necessary to take a world-wide survey of this market now. Year by year, the principal producing countries are adding to their output; and Germany to-day has probably outstripped this country as producers. Germany, indeed, is the main factor nowadays to be considered in the matter of the important export trade in sulphate of ammonia of this country. It has been the chief factor in driving our export business farther afield; and there must be gratitude for the demand that has sprung up, most propitiously in respect of time, in the remoter parts of the world. The tables in Messrs. Bradbury and Hirsch's report show an estimated increase in production in the year 1910 for the United Kingdom of 21,000 tons; the total being 369,000 tons. On the other hand, the total exports of sulphate—amounting to 283,772 tons—increased by 19,731 tons. In view of what has happened in the breaking away of our Continental export trade, the increase in the exports from this country is most satisfactory. Take France, Germany, and Belgium, alone. To those countries in 1908, we sent 57,263 tons of sulphate; in 1909, 49,142 tons; while last year there was the precipitate drop to 15,945 tons. Grouping Spain, Portugal, Italy, and the Canaries together, there has been a drop from 72,512 tons in 1909 to 67,116 tons in 1910. Therefore for the compensation for the Continental losses, we must look to the more distant fields of absorption. Java, Japan, and the United States (especially the last named) were of our best customers in picking up the loss of trade elsewhere, and augmenting the export business. The demand from the United States alone nearly doubled during the year—jumping from 35,080 tons in 1909 to 76,111 tons in 1910; and to the United States as a large prospective customer we may look hopefully. The fact that the demand from all quarters kept pace with the increasing output not only in this country but more particularly in Germany, despite the comparatively low price of nitrate of soda, and its abundant supply, reflects the growing credit of sulphate of ammonia as a fertilizer, and accounts for the satisfactory average price per ton for the whole year of £12 3s. 2d. f.o.b. Hull, which is 18s. 2d. above the average for 1909. This is the fourth highest average figure during the past ten years—the record average in the decade being £12 10s. 9d. for 1905. But while there is this satisfaction regarding the immediate past, and while the indications are that the world's requirements of sulphate of ammonia will absorb the world's output and sustain prices in the near future, it is impossible to make any confident prediction far ahead.

There is a point to be made concerning the estimated production of sulphate of ammonia in the United Kingdom during the past year. Messrs. Bradbury and Hirsch have computed it at 369,000 tons—an increase over 1909 of 21,000 tons. Their distribution of production and increase is as follows: From gas-works 168,000 tons, increase 4000 tons; iron-works, 21,000 tons, increase 1000 tons; shale works, 60,000 tons, increase 3000 tons; coke carbonizing works, and producer gas 120,000 tons, increase 12,500 tons. We shall not be surprised, when actual figures are available, if it is found that the reporters have overcalculated the increase from gas-works during the year, notwithstanding the advance in the output of gas. In 1909, the statutory gas-works in comparison with the previous year, carbonized 169,000 tons of coal less, though the output of coal gas was much greater, due to the higher make of gas per ton. Everything points to the returns showing a continuation of this experience in 1910; and the cheapness of oil, too, may have been favourable to an increased use of carburetted water-gas plants. But in view of the reduction in 1909, compared with 1908, of 169,000 tons in the quantity of coal carbonized, the fact that gas-works only produced 1000 tons less sulphate of ammonia in 1909 is an indication also of a better unit result in this product.

Local Authorities in Parliament.

THE opponents of progressive gas legislation would have people believe that anything new in this way is merely a crafty device of selfish gas companies to secure some advantage for themselves to the disadvantage of those they serve. Those opponents, as a rule, are municipal authorities who do not own gas undertakings, and who, more likely than not, are the controllers of the competing electricity supply. They have a direct interest in trying to make people believe that there is nothing under the sun so honest as municipal trading, and nothing so dishonest as joint-stock enterprise, especially in gas supply. Municipal authorities feign not to see that there is a closer relation and control of interests between company and customers than there is, or ever can be, between a municipal trading authority, which is a power unto itself, and its customers. They feign not to see too that, in the matter of gas supply, they have, by their electrical competition, tightened the intimacy that must exist between company and patrons if there is to be successful trading. But though that is the attitude and the feeling encouraged on the part of municipal authorities without gas-supply powers, it is noticeable how, session after session of Parliament, municipal authorities who are the governors of the local gas undertakings, show a very marked desire to be in the current trend of things in respect of gas supply. That which is said, on the one hand, to be the product of the selfishness of gas companies is, on the other, readily adopted as being politic by municipal gas authorities. Ownership has an exceedingly striking effect on the point of view. Here we have, on the one side, municipal authorities opposing a 14-candle power gas standard, with the "Metropolitan" No. 2 burner at one end of the photometer, while on the other the Rotherham and St. Helens Corporations and other Councils (who, of course, would not dream of doing anything repugnant to the interests, in this direction, of the townsfolk and industries) are following the numerous examples of previous sessions, and asking in their Bills that the illuminating power and burner prescribed in the Model Clauses shall be their standards.

Other features of the Bills noticed this week are the two or three cases of purchase, and the attempted shaping-up of supply districts so as to bring about conformity with administrative territory. The Bedwellty District Council are not only asking to purchase the gas and water undertakings of the Tredegar Gas and Water Company, but are seeking to exchange a small area with the Rhymney and Aber Valleys Gas Company, and are thinking of acquiring the property, at some convenient time, of the Blackwood Gas Company. The Margam District Council are also desirous of withdrawing a piece of supply area from the Aberavon Corporation. The Bicester District Council apparently see no hope of better circumstances being raised from the financial enormities of the Mid-Oxfordshire Gas Company; and therefore, in their wisdom, they believe it will be better to "cut the painter," and separate by purchase the local undertaking from the concern that has suffered from its very birth from the assailable methods of the promoters. This is a justifiable purchase, on fair terms, on the part of a local authority. Stand-by clauses, it has been shown in the last two issues of the "JOURNAL," are being freely asked for by companies; three of the local authorities whose measures are reviewed this week are requesting the right and privilege of similar protection—Marple, Rotherham, and St. Helens; the last two in respect both of private gas plants and electricity supply.

There are several miscellaneous clauses that arrest attention. The City Corporation want to impale owners as well as drivers of motor and other vehicles for damage occasioned by violently disabling gas or electric light standards; and the London County Council desire the right to regulate projecting shop lamps, illuminated signs, &c. No one can walk through the streets of London without being impressed with the necessity of a little subduing force in this direction; and it would be an excellent thing, in the public interest, and in the interests also of tradesmen themselves, if the power sought extended to the control of the dazzling, flickering, high-power lamps suspended in front of shops just above the heads of pedestrians, and almost in the horizontal line of vision of drivers and travellers on the top of motor cars and ordinary omnibuses. In the request of the Corporation of Belfast for power to borrow £100,000, one recognizes the first step in a busy time for the new Engineer of works reconstruction and extension. Special authorization is also

being sought from the same quarter to add to their business resources the making of differential prices for purposes other than illumination. Another form of special power is being asked for by the St. Helens Corporation, who are wishful to have conditional authority to supply gas to premises outside their area of supply. There is interest in these various matters.

Bearing False Witness.

We must protest, and that very seriously, against the licence taken by writers in some popular magazines in bearing false witness against the modern methods of utilizing gas. We cannot say how much harm is done among the technically uninitiated readers of popular articles of the kind by the pretence of the writers to real knowledge of the subject; and it is a feature of such articles—this is not peculiar to the theme—that the dogmatism and chimera contained in them appear to have some direct relation to the ignorance of the author. There seems to be a decided movement at the present time on the part of some of the popular writers in papers circulating among our girls and womenfolk, to leaven their minds with erroneous notions on the subject of modern gas utilization. On Nov. 29 last (p. 625), we were protesting against the untruths respecting gas lighting that were put forth in most positive fashion in an article on gas lighting in "Every Woman's Encyclopædia;" and we have to do so again to-day in respect of an article that has been published in "The Girl's Own Paper" for January, on "The "Question of Lighting the House." A correspondent who has drawn our attention to the article describes it as "a "monstrous violation of the truth." We agree with him; the whole article is a tissue of statements presented without a particle of scientific support. We should dearly like to put its author through his or her paces, with the view of ascertaining exactly the extent of even the rudimentary knowledge possessed on the subject upon which he or she presumes to write with so much arbitrary freedom.

The writer of this particular article has the candour to acknowledge that he or she cannot give a scientific explanation of a certain phenomenon that is attributed to the use of gas; and therefore from this we may conclude that the writer will not be prepared to vouch scientifically for much else that appears in the article. The phenomenon to which reference is made is this: Among the many vicious characteristics that gas is made to bear is that of enabling "rooms "where it is habitually used to develop a most irritating "type of dark, fluffy dust, which seems to have a distinctly "greasy quality." Does this rough-cut bit of vagueness represent something that happens with the refined incandescent means of using gas at the present day? It is a new disorder which is thus attributed to gas by this popular educator; but it is a quality that a long, large, and varied experience of gaslighting has not brought into our way previously. We are afraid that it is a case of the blind attempting to lead the blind. But this is only one of the evils assigned to gaslighting. Here is another: "The "fumes are so unhealthy that gas should never be used "to light bedrooms or living rooms where it is required "for any length of time." The author of this statement will do immense service to the gas industry by describing the character of the "fumes" that are so loosely avowed to be unhealthy. There ought to be no disappointment in obtaining from him or her either a full justification of the statements, or else a confession that there is more imagination than knowledge in the article in question, because the author has manifestly had to expend some thought in marshalling the several iniquities charged to the "poisoned "atmosphere of a room lighted by gas." The charges may be discussed separately and categorically when, if ever, we have a little light thrown on to the meaning attached by the writer to the words "poisoned atmosphere," and when we know in what way "if women abolished gas entirely from "their houses, it would mean a gain in health and an im-"provement in their complexions." Really these allegations of fresh iniquity are very embarrassing for gas, however incongruous they may be with human existence and experience. We who are accustomed to using gas day after day, and all the day constantly in these times, ought to have been cleared off the face of God's earth long since from the effects of that use; and the complexions of our lady friends ought by this time to be beyond description. But the fact of the matter is that gas is, through ignorance, tradition, and assumption, more sinned against than sinning; and we can point to numerous living examples of everything that is contrary to the dogmatic assertion of this misleading writer in "The Girl's Own Paper."

Our regret is that the editress of such a high-class popular paper should lend herself to the dissemination in our homes of assertions injurious to a great industry and a useful public servant that cannot be scientifically endorsed, but each one of which is capable of disproof both by science and a large experience in every city and town in the country. It would be infinitely more in character with the educational professions and aims of such a magazine if technically qualified persons were invited to deal with special matters of the kind, instead of leaving them, with the baneful result before us, to a writer who, on the very face of the article, shows that he or she cannot produce even an elementary scientific justification for the bald statements—statements made clearly without any sense of responsibility.

Mechanical Transport of Gas-Works Materials.

Under the presidency of Mr. Edward Allen, Engineer-in-Chief of the Liverpool Gas Company, the members of the Liverpool Engineering Society are this year brought into closer contact with gas-engineering work and problems than hitherto, and, as has been seen in previous issues of the "Journal" and now in the present one, in very interesting fashion. When reading the paper that Mr. R. E. Gibson, one of Mr. Allen's assistants, presented to the Society last Wednesday, on the "Mechanical Transport of Materials in "Gas-Works," the point as to the distant acquaintance of some of the members with gas-works structures and operations must be borne in mind; for, if Mr. Gibson had been submitting his paper at a meeting purely of gas engineers, several curtailments of matters of common knowledge to his auditors would have been made, and some of the descriptive plant details and comments would, in all probability, have received some expansion. But it is a good contribution of up-to-date experiences under both large and moderate working conditions—for the Liverpool works comprise both at the various stations—to an important and not many years since much misunderstood and highly controversial subject. What made it controversial, and why it was so misunderstood, were the mixed experiences that at one time existed; and those that were unsatisfactory were unquestionably due to the fact that types of plant were then adopted that were unsuitable to the prevailing conditions. But nothing could dispose of the concrete facts obtained by plant that was fitted to the conditions it had to serve, though costs and figures were mauled about and criticized in most confusing manner.

However, generally now among gas engineers such controversy has succumbed with time, experience as to requirements, and improvement in detail; and the mechanical handling of materials has, where operations are on a suitable scale, become commonly accepted as an important factor in gas-works economics and conditions, and, as a matter of fact, under the modern circumstances of heavy charge carbonization and pusher work, mechanical operation is indispensable to the securing of the highest retort-house efficiency. We will not emphasize the effects of the change from manual to mechanical transport. They are lightly touched upon by Mr. Gibson in the early part of his paper, while efficiency and financial considerations --the proofs of economic merit —are set forth in the tables towards the close of the paper. These tabulations are, through the variety of plant and conditions at the Liverpool works, as important and interesting to our technical readers as the engineering details, adequate attention to which in design and construction and during working prolongs active life, and reduces its costs. In this connection, the large experience with different conveyors and for different periods, long and comparatively short, as to cost of maintenance will silence many of those critics who speak rather from imagination than experience regarding the effect of upkeep on the question of economy. We will not refer to any particular forms of plant here, nor accentuate by reference the types of plant that show superior mechanical efficiency and over-all cost per ton of material handled. It may however, just be remarked that the low mechanical efficiency of the push-plate conveyor gives scope for consideration with an eye to further improvement, though the costs per ton already stand in favourable light. The tipping tray conveyor, from the author's statement of experience to the present time, will be well worth watching. The vibrating conveyor, both in mechanical efficiency and costs, is not presented in good light; but it must not be overlooked that,

in addition to transport, the plant fulfils the function of screening. But we will desist from further specific statement, heeding the caution of the author that the inferences to be "drawn from the tables must not be held conclusive, "without due consideration of all the conditions under "which each transporter has been working." The paper is one for study; and it will no doubt lead to comparisons of experiences in the matters of structural detail, mechanical efficiencies, and costs. If it does this, Mr. Gibson will be gratified.

The Insurance of Corporation Property.

The question of the insurance by municipalities of their property is one that has come to the front somewhat of recent years —to an extent, perhaps, on account of the continually growing undertakings in their hands. The plan of becoming their own insurers is one that appears to find increasing favour; and the adoption of such a course must be simplified when the property is situated in different parts of a town, so that any probable disaster would affect only part of it. The method is no doubt an economical one, at any rate so long as everything goes on as would reasonably be expected. But then, of course, to this some people might be inclined to reply that it is not always the expected which happens; and that this is just where the value of insurance policies comes in. At Belfast, the matter has been, and still is, occupying attention, inasmuch as certain recommendations by the Finance Committee have, after some discussion, been adjourned by the Council for further consideration. These recommendations were to the effect that existing policies should be renewed for the current year; and that, as the Committee were of opinion that the Corporation, acting as trustees for the ratepayers, incurred serious responsibility by not insuring all their insurable property, all such property at present uninsured should be insured to about 90 per cent. of its value. Further, that an insurance fund should be built up by annual contributions from the different funds, until a total of not less than £50,000 was reached; and that when the fund acquired reasonable dimensions, the existing insurances should be reduced from time to time, until they became unnecessary and ceased altogether. Several of the members seemed to be of opinion that the various Committees should be able to decide for themselves what proportion of their particular property should be insured; and the Chairman of the Gas Committee gave expression to some very decided views. He remarked that the local insurance companies charged a rate of 4s. 6d. per cent.; and then suddenly they jumped it up to 10s. 6d., which led him to propose that the Committee should become their own insurers, with the result that they had saved the ratepayers the sum of £27,000 which would otherwise have been in the hands of the insurance companies. In the course of his speech, he related an incident which, if it represented anything like the general practice of insurance companies, would (taken in conjunction with the attempt to raise the premium) be quite sufficient to explain the desire manifested by municipalities to become their own insurers. This was to the effect that the representative of one of the companies previously wishing to charge them 10s. 6d. per cent. came to him and said: "I will tell you what I will do. I will do it for 1s. 11d. per cent." In addition to this, however, the Chairman of the Committee urged that they should remain their own insurers in connection with the gas-works, inasmuch as there was nothing there liable to be destroyed by fire.

Coalite Shadows at Plymouth.

An indication of the approaching end of the coalite experiment at Plymouth is afforded in the fact that the office which was rented in the town for the sale of the fuel has been given up. It was in a central position, with a window abutting on a main thoroughfare, in which were displayed specimens of coalite, together with advertisements setting forth its merits. As an additional attraction, there used to be shown an array of specimen glasses containing ammoniacal liquor and tar, with the various products of its distillation, all to prove what a wonderful thing coalite is, and what is to be made of the bye-products of its manufacture. For some reason or other, these specimen glasses were withdrawn from the public view a few months ago. The window also ceased to contain the sample hundredweight of coal, which was exhibited in order that its bulk might be contrasted with the greater volume of a similar weight of coalite. Both the chemical specimens and the big bag of coalite seem alike to have failed to attract the people of Plymouth. The district is not one in which the consumption of coal is large, and if the Company's record were available, it would probably be found that the local demand for coalite has been infinitesimal. Efforts have been made to push the sale in the neighbouring district; but the people of Exeter and other towns in Devonshire have not been tumbling over each other in their eagerness to buy coalite. In fact, the fuel has been a drug on the market in the West of England. The difficulties which the coalite people have experienced in connection with the plant at the Plymouth Gas-Works have thus been accentuated by the trouble of selling a thing which few wanted to buy. Now that the office is closed, the Company will be rid of the charges for rent and other things which its maintenance involved. But coalite will be even less than a name in Plymouth.

Trade Expansion.

The effect of the state of trade is sharply mirrored in the returns of gas undertakings carrying on their operations in industrial and shipping centres; and therefore we may anticipate that, when the accounts for the year 1910 of such undertakings are issued, it will be found that the excellent condition of trade generally during 1910 will have had its effect upon their fortunes. There was a big revival in our foreign trade last year—the total increase being represented by £106,144,680. This was made up by an increase in the value of our imports of £53,735,216, in exports of £52,409,464, and in re-exports of £12,431,285. The increase is largely due to higher prices. Among the items which go to make up the addition of £52,409,464 in the value of exports are: An increase of £682,595 in coal; of £4,810,795 in iron and steel manufactures; of £1,239,078 in machinery; and of £1,788,970 in chemicals. The increase in the value of the shipments of coal is accompanied by a reduction of 1,730,000 tons in quantity. This is satisfactory.

Simple Lowering Gear for Gas-Lamps.

It may be remembered that in the "JOURNAL" for Oct. 12 1909, there was a letter from Mr. G. A. Hughes, the Commercial Manager of the London Electric Firm, in reply to some remarks which had appeared in the "Electricity Supply Memoranda" on the visit paid by the firm to Berlin, and their published views on the lighting of the city. Incidental reference was made to the lowering of lamps; and the writer stated that not only had this not presented any difficulty to the firm, but that the object of the visit to Berlin was to conclude an arrangement with a German concern for the manufacture in that country of arc-lamp lowering apparatus, made under their patents, which was equally applicable to gas-lamps. We recently received a pamphlet containing illustrated descriptions of the apparatus referred to, and views of various places in which it is in use for lowering lamps; and an opportunity has been afforded of examining the construction of the appliance. The winch embodies a new mechanical movement, and is self-contained both when raising and lowering. It has no pawls, gear-wheels, ratchets, springs, levers, or other small parts to become worn, deranged, or lost. The lowering gear consists of an improved contact and suspension device having one working part only. The device is very simple, comprising a plunger with two piston-ring contacts, and a pin engaging in a ratchet to take the weight off the rope, which does not require to be marked for position. The gear can be fitted to any existing suspended lamps, span wires, &c., and, by means of the adapters shown in the pamphlet, to lamp-posts and brackets. It is stated that from 75 to 85 lamps per day can be dealt with by one man, compared with 40 to 50 with two men using a ladder; and it is claimed that by the use of the gear its cost can be saved in one or two years.

Date of the Institution Meeting in Glasgow.—From a letter appearing in our "Correspondence" columns to-day, it will be seen that the Council of the Institution of Gas Engineers have fixed, Tuesday, June 13, for the first day of the Glasgow meeting.

Improvements in Illumination.—In an article on "The Progress of Applied Science in 1910" which appeared in the "Daily Telegraph" last Tuesday, by the Engineering Correspondent of that paper, the writer referred as follows to the improvements effected in illumination: "The demand for brightness in the home and the public meeting place has led to the detailed study of problems of illumination. The success of the new metallic filament lamps has, of course, greatly cheered the electrical engineers. It was not to be expected that the competing gas industry would be content with such a state of affairs. The battle still rages between the rivals; and the man in the street may be well satisfied, because he benefits. Competition stimulates invention. A feature of the year has been the extended use of high-pressure gas and the introduction of automatic gas-lighters."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 180.)

After a little hesitation, the Stock Exchange last week was more than ever determined to look at the bright side of things; and markets of pretty well all sorts became more or less buoyant. A noteworthy feature was the steady demand for best-class investments, which hoisted prices materially. Consols on Saturday were done at over 80—a price untouched for many a long week. The opening day was quiet and a little irregular. Most gilt-edged issues were strong; but Consols were not among them. The Foreign and American Markets were also firm. On Tuesday, the general tendency was much the same, without any strongly marked feature; but Consols were steadier. Business was more active on Wednesday, taking markets all round, with a very nice demand for choice qualities. Consols were $\frac{1}{8}$ better; and Railway secured issues were higher. Thursday was a brisk and cheerful day; and high-class investment stocks were in great request. Consols gained $\frac{1}{4}$; and Railway secured and ordinary were advanced in price. Markets were courageous on Friday. Business was at higher pressure, and buying was the general order of the day. Not even the stiffening of the Money Market (usually a red flag) could stop the progress of gilt-edged things. Consols rose another $\frac{1}{8}$; while in most other lines higher prices were made. The week closed with a very good Saturday—cheerful to the last. Consols gained $\frac{1}{8}$; and all the leading departments were strong. In the Money Market, the direction was not quite pronounced at first; but it soon took a very firm tone, which was maintained to the close. Business in the Gas Market showed no falling off from the previous week's accelerated pace, and the general strength was even more pronounced. A large number of issues—Metropolitan, Suburban, Provincial, and Foreign—advanced in quotation. In Gaslight and Coke issues, the ordinary was very firm at slightly higher figures; transactions ranging from 106$\frac{1}{4}$ to 106$\frac{7}{8}$. The secured issues were steady; the maximum realizing from 86$\frac{1}{2}$ to 87$\frac{3}{4}$, the preference from 103$\frac{5}{8}$ to 104$\frac{3}{4}$, and the debenture from 79$\frac{1}{4}$ to 80. South Metropolitan was firm and unchanged; all dealings being within the limits of 121$\frac{1}{2}$ and 122$\frac{1}{2}$. The debenture marked 81$\frac{1}{4}$ and 86$\frac{3}{4}$ *cum div.* In Commercials, there were dealings in the 4 per cent. at from 108$\frac{1}{2}$ to 112—a rise of 3. Among the Suburban and Provincial group, Brentford old changed hands at 255 (a rise of 1), ditto new at 196$\frac{3}{4}$ and 197 (a rise of 1), British at from 44$\frac{5}{8}$ to 45, South Suburban at 121$\frac{1}{2}$, and Tottenham "B" at 114$\frac{1}{2}$. On the local Exchange, Newcastle was done at 102$\frac{1}{2}$—a rise of $\frac{1}{2}$. In the Continental companies, Imperial realized from 185 to 186$\frac{1}{4}$, Union 89$\frac{1}{2}$ and 90, European fully-paid 24$\frac{3}{8}$ (a rise of $\frac{1}{2}$), ditto part-paid 18$\frac{1}{8}$ and 18$\frac{3}{8}$ (a rise of $\frac{1}{2}$), and Tuscan 8$\frac{7}{8}$ and 9$\frac{1}{4}$—a rise of $\frac{1}{4}$. Among the undertakings of the remoter world, Bombay new marked 5$\frac{1}{4}$ and 5$\frac{3}{8}$ (a rise of $\frac{1}{8}$), Melbourne 5 per cent. 100$\frac{3}{4}$ and 101$\frac{1}{4}$, Primitiva from 7$\frac{5}{16}$ to 7$\frac{1}{2}$, ditto preference from 5$\frac{1}{4}$ to 5$\frac{3}{8}$ (a rise of $\frac{1}{8}$), and River Plate debenture 96$\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

The Electric Slot—Anticipation and Realization—A Municipal Employee's Spare Time—Electricity for Nothing—A Specific Case Wanted of "Unfair" Methods—Poor Man's Light—Beautiful Indefiniteness.

Not much has been heard of electric slot meters lately. They never were popular; and they were always a supplementary nuisance to users of electricity. The consumer of electricity with an ordinary meter has quite enough to put up with from faults and frights, without the additional worries introduced by the complication of prepayment mechanism. No one has any confidence in such meters; and electricity suppliers have been rather keener on removing them than in adding to their number. The philosophical argument is that "for all the good that these meters are, we might just as well come to some terms with the electricity user as to what he shall pay, and then trust to his honesty and to Providence for a fair use of the current." Messrs. A. T. Bullen and H. E. Goody recently made a joint contribution to the "Electrical Review" on the subject of the demerits of the electric prepayment meter; and they catalogue and tick them off one by one in the deliberate manner that suggests they know the electric slot meter has such few friends that they can do this with the utmost impunity without incurring disfavour or being charged with malice. Apart from mechanical and organic defects, the authors do not like the prepayment meter on the ground that it is unfair to the users—the most prominent feature of the system being that the greater the amount of electricity consumed, the more the consumer pays for the privilege of being a prepayment consumer. The penalizing of users in this way is considered by the authors to be unjust. Then electric slot meters cut off the electric light, and drop patrons suddenly into darkness, without any sort of warning; and users have to go fumbling about in their attempts to find the meter and then the slot for inserting another coin.

In some meters it does not seem to matter much whether or not coins are dropped in, so long as there are sufficient inserted to appease the collector when he calls. This is amusing. A friend of the writers of the article had a prepayment meter for two years, and not for a single week during the whole period did it work correctly; and he got into the habit of putting into the meter each quarter 4s. or 5s just before the collector called. The meter was a good friend, and so too was its successor, for they never on any account switched out when the prepaid amount of current had been exhausted. It is believed that this consumer had the use of three times as much current as he ever paid for. Another painful and irritating defect is shown by a fairly recent meter, which switches out if it is subject to the slightest jar, such as may be caused by the shutting of a door. A supply company, with about 300 of these meters installed, has decided to scrap the whole lot as opportunity occurs rather than bear any longer with their vagaries. Penny-in-the-slot meters are becoming obsolete; and about the latest pattern of shilling-in-the-slot meters, the writers do not appear to be over-sanguine. At all events, from the final words of the article, it may be taken that there is yet dissatisfaction; for the authors, looking to futurity, say: "When perfection in design and construction is attained, it will remain only for supply authorities to devise some system of charging less unfair than the present one before the slot-meter becomes almost universally popular." There has never been on the part of the gas industry the remotest fear of the electric slot meter; and its existing position confirms the correctness of the view."

The Sleaford electricity undertaking is one of those local authority ventures that have to scrape and to pinch in the effort to shorten the expenditure as much as possible, and to stretch the revenue so that it will cover the expenditure. But the result is an inglorious one. The expenditure refuses to shrink and the revenue to expand so that the one shall show an equality with the other, or so that there shall be a golden margin beyond the outlay. The Sleaford undertaking is one of several in the country that unsophisticated local rulers took unto themselves in the fond belief that electricity was a sure producer of the shekels that would relieve the rates. Year after year they have had to swallow the disappointments of an ill-founded faith. With all the straining on the part of the managers of the Sleaford undertaking during the last financial year, this item has to appear in the net revenue account, "Amount received from local rates £290 14s. 10d." It is seen that the sale of current only produced £829; and public lighting, £481. From the ratepayers therefore, in addition to the £290 shortage, half as much as the concern can secure from private consumers is taken for public lighting. The two items supplied by the ratepayers amount to over £770, which is only £50 or so short of the total private revenue. Then a few scraps of revenue are secured by selling and repairing lamps, £10; compensation, 10s.; and premium of pupil, £30. We pity the engineer, unceasingly racking his brains as to how to secure a better financial return for the concern, and himself rewarded for all his anxiety and pains and technical training by only £162 10s. a year, for being deprived of that £30 pupilage premium, in order that it may make the revenue look to that extent the better. The balance on revenue account is only £354, notwithstanding the moderate items of expenditure; and that is all there is towards sinking fund and interest. There are no allowances—no money being available—for depreciation and reserve. Viewing all these things, we can hold out no hope of the concern ever presenting a sound financial position that would delight the hearts of the district councillors who a few years ago were dreaming of the treasure that lay behind that infatuating word—electricity.

In Maidstone there seems to be little question in the public mind that the fatal and destructive fire that was caused at a large emporium at Christmas time had electricity as its originating cause. But there has been a side-issue from the catastrophe. It was given in evidence at the inquest on the lad who lost his life in the fire (see "Journal," Dec. 27, p. 912) that the work of making the temporary installation of extra lamps on the ill-fated premises was carried out by a member of the Corporation electricity staff. The Chairman of the Maidstone Gas Company (Mr. George Marsham) has called the attention of the Mayor to this matter, pointing out that there appears to have been here an infringement of the undertaking given some time since on the part of the Corporation that they would not indulge in such work, which was in excess of their statutory powers. The Leicester decision since the undertaking was made has given fresh expression to the illegality of municipal authorities entering into wiring and fitting work, and the supply of appliances, without specific statutory powers; and naturally sensible municipal authorities will not deliberately run themselves into litigation now that their powers have been so strictly defined. The explanation in this Maidstone case appears to be that the member of the Corporation staff who made the temporary installation on the premises in question did it in his own time, and was personally paid for the work. It was also suggested at the inquest that the same person inspected the installation twice a day to see that everything was right. Without specially applying it to Maidstone, the question arises as to whether, or how far, it is advisable to let servants of a Corporation Electricity Department undertake work of this kind in their spare time. It is quite conceivable that some enterprising workmen could exploit an electricity department for obtaining considerable and lucrative business to their own gain, and in opposition to the interests of local tradesmen. The idea, in fact, is capable of a good deal of expansion; and perhaps the safest course is to discountenance anything of the kind. If the Maidstone Corporation had had wiring and fittings powers, would they have allowed an employee of the department to undertake such work in his spare time? To do so would be sure to lead to muddle and trouble.

In a Hastings newspaper, there is an advertisement headed "Electricity from the Wind;" and in the matter appended, it is seen that apparatus has now been designed whereby electrical energy can be obtained free of cost. We turn over the pages of the same newspaper, and find a report of the meeting of the Hastings Town Council, at which Mr. Councillor Matthews catechized the Chairman of the Electricity Committee (Mr. Hill) as to why 2d. per unit is charged for working lifts (which are used during the evening as well as the day time), while other consumers are charged the prohibitive price of 6½d. It was the old story that this lift-use assists to a large extent in developing the day load. "The only expense," said the well-primed Mr. Hill, "involved in generating the extra current is the cost of coal; and this, as I have explained before, only costs 1·06d. per unit." Now if coal is really the only charge, there is a chance for the Committee to out-Fergusson Fergusson, the Borough Electrical Engineer. There is the electricity-from-the-wind scheme. Use the free wind instead of coal, and the Chairman of the Electricity Committee will perhaps be prepared to say there will be no other expense for electricity for supplying lifts; and so for that purpose, electricity can be furnished free of cost for the ascension or descension of people in Hastings who have any aversion to the use of their nether limbs. Of course, Mr. Hill does not know of any other expense than that incurred in the feeding of the boilers with coal during daylight hours, with running machinery of an expensive type. If what Mr. Hill says is true, then the sort of thing that he defends could go on indefinitely, and (it would be a logical supposition with the premises correct) the farther the better.

The foregoing matter, as to the twopenny charge per unit for lifts, was, as mentioned, raised by Mr. Matthews—a gentleman who has yet to get accustomed to the subtleties of municipal controversy when dealing with matters electrical. He asked Mr. Hill why it was that the charge for current supplied to the public electric arc lamps was last year increased from 3d. to 4d. per unit, and yet only 2d. was charged for the current supplied to the smaller public lamps. Mr. Hill replied that it was not a fact the charge was increased last year from 3d. to 4d. Was it in ignorance that the Chairman made this denial? or was it a deliberate evasion based on the two facts that the inquiry was not made until the beginning of 1911, while the increase in price took place in July, 1909? It is to be hoped that Mr. Matthews will pursue his inquiries. The same Councillor also inquired why it was proposed that the Board of Guardians should be charged more for current than "outsiders." Presumably he meant private consumers; but the Mayor denied that the Committee charged 2d. per unit to outsiders. Perhaps the Mayor will (if he does not know them as he ought to do) look into the prices charged for heating and power.

After again reading very deliberately, with the view of giving the words their full import, the extracts from the impressions on the year 1910 of our friends of the "Electrician" and "Electrical Review" (as quoted last week), it seems to us there are one or two points on which further explanation is required. The first-named contemporary, it will be remembered, said: "Electric lighting has made satisfactory advance during the past twelve months, notwithstanding the unfair competitive methods employed by our gas friends." We give the Editor of the paper credit for not making this charge lightly; and therefore there will be no hesitation on his part in expanding a little upon it for the enlightenment of the gas industry, in which there is a desire to respond fully to fair dealing in competition. But unfortunately there has been little encouragement from the side of the electrical industry. However, there exists a desire for a specific example of the "unfair" dealing to which the "Electrician" refers. Our contemporary will without doubt willingly give it, with a statement as to the manner in which it was unfair. We shall see from this the extent of the courage that finds foundation upon the convictions of our friends. Vague accusations of the kind are despicable, if they cannot be supported by proof. We await with interest the reply; and we hope, for more reasons than one, that our friends will not see fit to ignore this request. There is a beautiful chance for the "Electrician" to fully justify itself.

The statement in the "Electrical Review" upon which explanation would be of interest, if we have not already hit upon it, is a simpler matter. "We have observed," says this organ of light and leading, "with great satisfaction during the past year the enterprising efforts of electricity works' authorities in a number of places to prove beyond a shadow of doubt that nowadays the old and once sceptically regarded cry of electricity being the poor man's light is absolutely true." What we gather from this is that efforts have been made to prove the absolute truth of the statement; but it is not said whether the efforts have been successful. Our contemporary surely cannot mean those crazy plans of supplying at a fixed price, and allowing the consumer to run the lamps to his heart's content without any safeguard in the nature of a meter, and then getting, or rather trying to get, the landlord to act as collector to the electricity suppliers. If those are the schemes to which the "Review" refers, we will not trouble it for further explanation, as an opinion has already been formed that is not altogether complimentary to them or to their authors.

We intend to keep closely in touch with the question of the lighting of the Hastings Workhouse, as it is so flagrant an example of the control of a majority of a Board of Guardians by a Municipal Electricity Department, in the matter of the lighting of the establishment entrusted to the former, to the detriment of both illumination and cost. We have shown the meagre lighting that has been offered by the Electricity Department, the expenditure that has to be incurred to provide it, and the absolute refusal of the Guardians to consider all offers of the Gas Company to enter into the question of the modernizing of the gas-lighting arrangements, and their proposal to provide (if preferred) electricity for lighting at less cost per unit than the Electricity Committee, by an installation of private plant. There are a few words to say now about the beautiful indefiniteness of the scheme of the Electricity Committee; and that indefiniteness we undertake to say will continue for some time to come if the poor scheme of illumination by the Borough Electrical Engineer is introduced, which is questionable if the Local Government Board give due weight to all the points that will no doubt be placed before them when considering the application for loans for the wiring of the workhouse and for the £380 that the Corporation will require for a special cable for the purpose of supplying the premises. But about the indefiniteness of the lighting scheme. A report has been presented to the Council which shows that already it has dawned on someone that the original plans are deficient. Electrical estimates are generally considerably short of the actual final issues. In the report to the Council, the forward movement commences. The original scheme suggested that 468 points of lighting would suffice; the bulk being of 17-candle power! The number of points has already grown to 500; and after a little groping about the place by the officials and inmates of the workhouse if the scheme is carried out, the number will soon further expand. The cost of the current was calculated at £190 per annum. Mr. Hill, the Chairman of the Corporation Electricity Committee and a member of the Board of Guardians, now hopes it will not exceed £190. But the Electricity Committee have guaranteed it shall not exceed £220! apparently without lamp renewals. It is all so grandly and grotesquely indefinite. The only thing the majority of the Board of Guardians are really certain about in regard to this scheme is that in respect of it the Corporation Electric Lighting Committee have so far been their masters. One other point. We referred last week to the use of a gas-driven electricity generating plant for the St. Leonards Pier, whereby current was obtained cheaper than the Corporation could supply it at. The facts from the Corporation side are these: The lessees of the pier offered to take current from the Corporation at 2½d. per unit. This, seeing that it involved the laying of a main costing £1000, the Corporation properly declined to accept. Subsequently, they offered the current at the same rate as to large consumers—namely, 6½d. per unit, less 25 per cent. (which is the proposed rate for the workhouse), but with the proviso that, if the account reached £500 annually, current should then be charged at 6½d., less 50 per cent. Gas won. What says the doughty "Meteor" to this?

COMPARATIVE FIGURES FOR HORIZONTAL AND VERTICAL RETORTS.

The report for the working year 1909-10 of the Coporation gas-works at Offenbach (a town on the Maine not far from Frankfort) contains some interesting comparisons between the working results obtained in that year, when the carbonization was carried out exclusively in Dessau vertical retorts, and the working of previous years with horizontal retorts. The report has been published in a recent number of the "Journal für Gasbeleuchtung."

The vertical retort installation at Offenbach, which has already been referred to in the "JOURNAL" [Vol. CVI., p. 969], comprises twelve settings each containing ten retorts, 4 metres (13·1 feet) in length. During the past year, however, eight settings sufficed for the maximum output; so that 50 per cent. of the plant was kept in reserve. The gas sold amounted to 6·55 per cent. more than the previous year. The coal carbonized consisted of almost equal quantities of Saar coal and English coal. The make of gas per ton of coal in the vertical retorts with steaming amounted to 14,009 cubic feet at 60° Fahr. and 30 inches [assuming that the figures in the report are volumes corrected to 0° C and 760 mm.; as is usual in Germany, though it is not stated that this is so in this case]. The previous year, when horizontal retorts were used, the average make per ton of coal was 11,771 cubic feet. The average weight of a charge in the vertical retorts was 9·8 cwt. The time allowed for carbonization was twelve hours, and steam was admitted during the last hour-and-a-half. The wages per 1000 cubic feet of gas made amounted with the old horizontal retorts to 3·56d., and with the present vertical retorts to 1·18d. In both cases eight-hour shifts were worked. The saving in wages on a make of about 250 million cubic feet per annum would, therefore, amount to about £2480. The gross calorific power of the gas averaged 541 B.Th.U. per cubic foot. The fuel consumption per 1000 cubic feet of gas made was 29 lbs. of coke. The ammonia produced amounted to 0·23 per cent. (real ammonia) of the weight of coal carbonized. In the horizontal retorts the corresponding figure had been only 0·11 per cent. The make of tar averaged 5·1 per cent. of the weight of the coal carbonized, against 5·3 per cent. for horizontal retort working. The cyanogen washers yielded 222 cwt. of prussian blue in the year. The coke produced amounted to 73·5 per cent. of the weight of coal carbonized, against 74·7 per cent., which was the produce of the earlier horizontal retorts.

INSTITUTION OF GAS ENGINEERS.

PUBLICITY AND SPECIAL PURPOSES COMMITTEE.

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(*Chairman, South Suburban Gas Company.*)
H. E. JONES, London
(*Chairman, Wandsworth and Putney Gas Company.*)
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ALEX. WADDELL, Dunfermline
R. WATSON, Doncaster
W. WHATMOUGH, Heywood
CORBET WOODALL, London
(*Governor, Gaslight and Coke Company.*)
JOHN YOUNG, Hull

A Brief Account of the Origin and Objects of the GAS PUBLICITY COMMITTEE, formed from the Institution of Gas Engineers and the Joint Commercial Sections of District Associations of Gas Engineers and Managers, 1910.

1.—For some time past, various District Gas Associations have had in active operation Commercial Sections delegated from their membership, having for their object the promotion of co-operation, and the avoidance of clashing, in respect of the business dealings of the undertakings. These organizations have worked remarkably well in the interests of the constituent undertakings, which have thereby been enabled to effect many economies, to secure increased revenue, and generally to help one another by circulating commercial information, and otherwise.

2.—At meetings of these Sections, serious and increasing attention has been given to the widespread want of knowledge prevailing in regard to the advantages and the continually growing applications of gas for domestic and industrial purposes. The absence of more widely diffused information on these matters, and of the progressive attitude of gas undertakings generally, seriously hampers the development of the industry.

3.—At a largely attended conference of the Commercial Sections, convened under the auspices of the Institution of Gas Engineers, it was unanimously agreed that action should be taken to bring the many advantages and utilities of gas more prominently before the public by well-considered advertising of various descriptions, and by taking full advantage of such opportunities as may arise from time to time for setting the true merits of gas before the public in a favourable light.

4.—The matter having been further considered by a Committee of the Commercial Sections, a scheme was laid before the Council of the Institution, who decided forthwith to form a Publicity and Special Purposes Committee, comprising the members of the Council, the members of the before-mentioned Committee of Commercial Sections, and co-opted members to be invited from representative Gas Committees and Gas Companies.

5.—The advertising and publicity work which the Committee propose to undertake would be of a general character and aim, comprising mainly advertisements and articles in publications which circulate throughout the kingdom. Subscribers would, however, also have the very great advantage of being able to obtain for local purposes expert assistance, advice, and information. Skilfully prepared "copy" for local newspaper advertising, well-designed posters, booklets, and other advertising matter, would, moreover, be supplied on very advantageous (because wholesale) terms, such as no single undertaking could possibly secure for itself. The Committee would also assist undertakings in organizing local exhibitions, lectures, &c.

6.—A representative Executive Committee, with expert assistance, would direct the operations of the organization, and control the application of the funds.

7.—A necessary preliminary to further action is the financial support of the whole British gas industry; and the Committee therefore now appeal to all the gas undertakings of the United Kingdom for such support.

8.—It is proposed that the basis for calculating the subscription be the annual quantity of gas manufactured, and that yearly subscriptions be invited for a minimum period of three years, at not less than 2s. 6d. per million cubic feet.

9.—This annual contribution would be regarded by the Institution as providing also the fund for "Special Purposes," for which a separate appeal has hitherto been made; but it would be understood that not more than 10 per cent. of the amount subscribed might be devoted in any year to any special purpose other than publicity work.

10.—It may be mentioned that the Directors of the Tottenham and Edmonton Gas Company, upon receiving intelligence of the proposed movement, at once offered to contribute to the fund at the rate of 2s. 6d. per million for three years certain, if fifty undertakings would do the same. Since then a number of other gas undertakings have promised support, including one so far afield as Australia.

11.—It must, however, be clearly understood that it would be impossible for the Committee to proceed with the scheme unless it receives the support of a substantial majority of the undertakings of the kingdom. As the movement would be a benefit to all, and proportionately to the magnitude of each, it is only equitable that all undertakings should bear their share of the cost.

12.—The Committee earnestly hope that all gas undertakings will become subscribers, and thereby help forward the industry, the magnitude and importance of which are indicated by an invested capital of over £132,000,000.

ALEXANDER WILSON, Chairman.

39, *Victoria Street, Westminster, Jan.* 2, 1911.

PERSONAL.

Professor HAROLD B. DIXON having completed his term of office as a Pro-Vice-Chancellor of the Manchester University, is succeeded by Professor Tout.

Mr. JAMES C. WATSON has left the service of the Oriental Gas Company and is, we understand, now in England. He was appointed as Assistant to the late Mr. Niven in October, 1896, and was promoted to be Chief Engineer at Calcutta on Mr. Niven leaving India in August, 1903.

At the meeting of the Institution of Civil Engineers last Tuesday, it was announced that Mr. J. W. BUCKLEY, the Engineer and Manager of the Hornsey Gas Company, and Mr. H. L. PEARSON, engaged at the Carno reservoir works at Beaufort, in Breconshire, had been transferred from the class of associate members to that of members.

OBITUARY.

The death occurred on Monday last week of Mr. CHARLES PANCHEN, who was Secretary of the Great Yarmouth Gas Company for 45 years—a position he relinquished about four years ago. Deceased was in his 65th year.

The death occurred on Monday last week, after a short illness, of Mr. JOHN CHARLES JOHNSON, resident Manager (under Mr. Iago, the Engineer) of the Shoreditch station of the Gaslight and Coke Company. Deceased was a son of the late Mr. John Johnson, who many years ago held the position of Distributing Engineer of the Company; and he entered their service in 1885 at the St. Pancras station. After several changes, he was transferred to Shoreditch about a year ago. The funeral took place at Abney Park Cemetery on Thursday. Mr. Johnson was 40 years of age, and leaves a widow and a daughter.

Funeral of Sir John Aird.—The funeral of Sir John Aird took place last Wednesday at Littleworth, near Beaconsfield. A large number of people attended the service, which was conducted at St. Anne's, Dropmore, on Littlemore Common, by the Rev. J. B. Shackle, the Vicar, assisted by the Rev. A. S. Commeline, Rector of Beaconsfield. The service was concluded at the graveside by the Rev. E. P. Anderson, Vicar of St. John's, Paddington. The chief mourners were Mr. John Aird (son), who succeeds to the baronetcy, Mr. and Mrs. and Master Malcolm Aird (son, daughter-in-law, and grandson), Mr. Bean (son-in-law), Mrs. Whittaker Ellis (eldest daughter), and Mr. Whittaker Ellis (grandson). A memorial service, at which there was a large congregation, was held at noon in St. John's Church Paddington. The Archdeacon of London (Ven. W. M. Sinclair, D.D.) officiated, assisted by the Rev. F. R. Smith, a nephew of Sir John Aird, who was churchwarden at St. John's from 1900 to 1903.

THE INVENTION, DEVELOPMENT, AND PRESENT POSITION OF THE DESSAU VERTICAL RETORT.

[COMMUNICATED]

I.

THE early years of the Twentieth Century will be noteworthy in the history of the progress of gas manufacture for the great changes which they marked in the types of plant employed for the carbonization of coal on gas-works. Foremost among the new carbonizing plants stands the Dessau vertical retort, both on account of its having been the first plant of its kind to be developed on a practical working scale, and on account of the extent of its adoption from the time of its introduction right up to the present moment.

This series of articles is written with the object of tracing the inception of the Dessau vertical retort, its rapid development, and present position; and of putting upon record the more significant of its carbonizing achievements, especially those relating to descriptions of coal with which English gas engineers are familiar. The theoretical basis of the Dessau system of carbonizing will also be discussed, and a distinction drawn between the procedure of gasification in the Dessau vertical retort and that of gasification in horizontal or inclined retorts, large chambers or ovens, and vertical carbonizers into which the coal is fed and from which the coke is removed continuously. The writer of the articles has no financial or commercial interest in the Dessau vertical retort system, and in them merely aims at bringing together the most striking facts and data relating to a system of carbonization which, whatever may be its ultimate fate, has in recent years attracted a greater amount of attention and drawn upon itself more criticism than any other.

There is the more justification for the publication in the "JOURNAL" at the present time of such a statement of the origin and progress of the Dessau vertical retort because English gas engineers are apt to regard it as a system not directly applicable to their requirements, owing to the majority of existing installations of it being on Continental gas-works, where the coal carbonized is frequently of a different character, and where the requirements in respect of the illuminating power and calorific value of the gas made and of the quality of the coke produced, are sometimes different from those obtaining in their own districts. Also, in the minds of a few, there may still lurk a slight prejudice against the Dessau system because of its foreign origin. But to any such into whose hands these articles may come, the writer would point out that, of the two Continental gas undertakings which were responsible for the early practical trials and development of the system, one—viz., the Imperial Continental Gas Association—is financed by English capital and is controlled by a Board of Directors sitting in London. Moreover, the rights of construction of Dessau vertical settings in the United Kingdom and British Colonies are vested in an English Company; and the materials are supplied and the work carried out by well-known English firms.

The inventor of the Dessau vertical retort—Dr. Julius Bueb, of Dessau—even prior to its invention, had attained to a position of considerable eminence among gas men by reason of his pioneer work in the development of processes for the extraction of cyanides from coal gas, and for the removal of naphthalene from gas by washing the latter with oil.

THE NAPHTHALENE QUESTION.

It may have been the attention which Dr. Bueb was forced to give to the naphthalene question in his position as Chemist to the German Continental Gas Company—who, though their headquarters are at Dessau, are responsible for the gas supply of many towns on the Continent, some of which (such as Warsaw) are of very much greater size than Dessau—that led him on to the evolution of the vertical retort, one of the chief features of which is that it avoids the production of naphthalene. The removal of naphthalene from coal gas by washing the gas with an oil having good solvent powers for naphthalene was an excellent palliative measure. But Dr. Bueb recognized that the gas engineers and chemists who belived that, in dealing with the occurrence of naphthalene in gas, "prevention was better than cure" were right; and he has always proclaimed that one of the main objects attained by the vertical retort has been the prevention of the formation of naphthalene. Even before he had introduced his vertical retort, Dr. Bueb tried a method of carbonizing in horizontal retorts which it is now well recognized results in a considerable reduction in the amount of naphthalene produced. In conjunction with the German Continental Gas Company, he obtained a patent—No. 13,814, dated Aug. 1, 1900 (the corresponding German patent, No. 119,473, was dated July 18, 1899)—for improvements in the manufacture of gas and coke; and in the course of his specification, he stated that the retorts were to be entirely filled with the coal, which was then to be heated in the usual manner for gas making.

The main object of the invention covered by this patent was the production in gas-retorts of coke which should be in no way inferior to that produced in coke-ovens. With this object in view, the coal was powdered and moistened prior to being charged into the retort. Nevertheless, it was clearly stated in the specification that the retort was to be charged full; and it is a fact well worth noting that at the present day horizontal retorts would be giving far worse results as compared with vertical retorts were it not that the practice of charging them full has been introduced on gas-works some time since Dr. Bueb suggested it in 1900 with a view to the improvement of the quality of the coke produced. An incidental advantage of the full charging of horizontal retorts is recognized to be that the quantity of naphthalene formed is reduced. Dr. Bueb, however, was not content to stop at the point which he had attained in 1900, of charging horizontal retorts full. He went on to modify entirely the retort with a view to effecting, *inter alia*, the complete prevention of the formation of naphthalene in the carbonization of coal. The modification was intended to, and did, secure other important advantages to which reference will be made later. But it is worth while noting that the development of the vertical retort by Dr. Bueb forms the final stage in a continuous line of work undertaken by him with the object of overcoming the naphthalene trouble on gas-works.

THE EVOLUTION OF THE VERTICAL RETORT.

Experiments on the carbonization of coal in vertical retorts were in progress at the Dessau Gas-Works for several years before the publication by Dr. Bueb, on Sept. 20, 1905, at a specially convened meeting of eminent Continental gas men, of a description of the form of vertical-retort setting which is now identified with the name of Dessau, and of the results obtained with it on a working scale. As early as Nov. 19, 1901, the German Continental Gas Company and Dr. Bueb had applied for a patent in Germany for a type of vertical retort for the manufacture of lighting and heating gas, and the patent (No. 140,928) was granted; but the specification was not published so soon as that of the corresponding English patent—viz., No. 15,154, dated July 7, 1902. The specification of the English patent was reproduced practically in full in the "JOURNAL" [Vol. LXXXII., p. 667]. In the specification, the patentees stated that a great advantage of vertical retorts is the easy and cheap charging and discharging of them. They attempt by their invention to secure this great advantage, while doing away with disadvantages hitherto incidental to the vertical type of retort.

It is pointed out that the interior of the vertical retort can be entirely filled with the charge, whereas the practice with horizontal retorts at that time was to fill them not more than half full. The attempt was made in this retort to prevent the gas evolved becoming decomposed to an injurious extent by contact with extensive and highly-heated surfaces. At that time the patentees considered that this could best be accomplished by providing for the removal of the gas as produced a vertical slit or a number of lateral openings on one side of the vertical retort. The intention was to prevent the highly valuable lighting and heating hydrocarbons first evolved from the coal being decomposed, as in horizontal or inclined retorts, into hydrocarbons of less value, through contact with the overheated walls of the retorts, and to prevent any troublesome formation of carbon taking place. The formation of naphthalene was not specifically referred to; but it has been well established that naphthalene is a product of the decomposition of the more highly valuable lighting and heating hydrocarbons first evolved in the carbonization of coal when they are exposed to a high temperature. For instance, F. Haber and H. Oechelhaeuser demonstrated, in 1897, that naphthalene was a conspicuous product of the decomposition of structurally simple hydrocarbons such as hexane and trimethylethylene when they were exposed to temperatures of about 940° C., whereas it was absent in the products of decomposition of the same hydrocarbons at considerably lower temperatures [see "JOURNAL," Vol. LXIX., pp. 476 and 528]. There is therefore no doubt that one of the specific objects of Dr. Bueb in the design of his first type of vertical retort was the prevention of the formation of naphthalene through the decomposition by superheating of the highly valuable lighting and heating hydrocarbons of the gas.

It will be seen that a certain stage in the experimental work at Dessau which ultimately led up to the invention of the present type of Dessau vertical retort had been reached in November, 1901, when the patent for the first form of Dessau vertical retort was applied for in Germany. But Dr. Bueb and his co-operators were not content with the partial success then achieved, but continued their experimental work with a view to perfecting the vertical retort for use on gas-works. The next definite stage in the evolution of the Dessau vertical retort was the provision made (according to the English patent No. 15,147, dated July 8, 1903) for the admission of steam into vertical retorts with the object of improving the make of gas and of utilizing better than hitherto the heat applied to the retorts. It was proposed, when the yield of gas from the carbonization of the charge began to decrease, to introduce steam at the lower part of the retort, with a view to the formation of gas from the incandescent charge in the retort. In this patent, it was stated that if the vertical retorts had lateral gas outlets they must be closed before the steam was introduced. Thus it is found that early in 1903 Dr. Bueb showed that it was possible to dispense with the lateral gas outlets in his vertical retort, and that it was necessary to close them, if present, at the stage when steam began to be admitted to the retort.

There was from this point onwards very rapid progress in the evolution of the Dessau vertical retort; for it was as early as July 29, 1903, that the German patent No. 167,367, which constitutes the master patent for the Dessau type of vertical retort setting, was applied for by the German Continental Gas Company and Dr. Bueb. The corresponding English patent is No. 1393,

dated Jan. 19, 1904 [" JOURNAL," Vol. LXXXIX., p. 28]. In this patent specification the nature of the invention was set out with great clearness. It was stated to consist in "an improved method of distilling coal whereby gas is obtained from the retorts entirely free from naphthalene, and a liquid tar is produced, while the amount of apparatus and labour, and consequently the cost, are reduced." The claim made was equally explicit and comprehensive. It was for: "The manufacture of gas by subjecting coal to distillation in a vertical retort heated to a higher temperature than is usually employed in gas manufacture, so that coke is formed from the internal walls of the retort inwards and the gas generated passes inwards and upwards through the central portion of the charge; the retort being charged with coal up to the same level as that up to which the external heat is applied, so that no space is left in which the tar can quickly separate—it being compelled to pass upward through the uncoked internal portion of the charge before leaving the retorts, substantially as, and for the purposes, hereinbefore described." The patentees clearly stated also that, in the making of coal gas as hitherto practised, a great inconvenience was that the gas obtained contained a considerable amount of naphthalene, which required to be removed from the gas before the latter was ready for use; and its removal necessitated a considerable amount of apparatus, labour, and expense. Later, the patentees stated that the gas produced by their process did not contain naphthalene, or at most only traces of it. Thus it will be seen that, as already indicated, one of the main objects which Dr. Bueb had in mind was the removal at their source of the troubles arising from the presence of naphthalene in coal gas as hitherto made.

High Temperature of Carbonization.

It has already been pointed out that it has been proved experimentally that naphthalene is a product of the decomposition of the more highly valuable lighting and heating hydrocarbons first evolved in the carbonization of coal when they are exposed to a high temperature. Nevertheless, the patentees of the Dessau vertical retort state that the distillation of coal in it is accomplished by heating to a higher temperature than is usually employed in gas manufacture. Previously, high heats of carbonization had always been regarded as involving a relatively large production of naphthalene; and in horizontal and inclined retorts, there is no doubt that, *cæteris paribus*, an increase in the temperature is attended by an increase in the amount of naphthalene in the gas and the tar produced. The increased formation of naphthalene at high heats really becomes such a serious matter that it sets a limit to the heats at which horizontal and inclined retorts may be worked in practice. An appreciable increase in the working heats may be tolerated if Dr. Bueb's early suggestion of filling the retorts full is followed; and thus the additional make of gas per ton of coal which an increase in working heats affords may be secured, provided the retorts are charged full, without an absolutely prohibitive concomitant growth of naphthalene troubles.

The adoption of such a procedure is, however, only a half measure, because naphthalene troubles, though reduced, are not dispelled. However full a horizontal or inclined retort may be charged, the gas must naturally for a great portion, if not the whole, of the period of carbonization pass in contact with the highly heated crown of the retort on its way to the ascension pipe, and thus receive a considerable degree of superheat from the highly-heated retort and the incandescent upper crust of coke. The conditions requisite for the formation of naphthalene are inevitably present in the horizontal and inclined retort worked at high heats, though, by the adoption of full charges, their effect on the gas may be somewhat diminished. Really high heats which will afford the maximum make of gas per ton of coal carbonized can only be practically adopted if provision is made for the removal of the evolved gas without allowing it to be superheated by contact with a large area of highly-heated retort wall or incandescent coke. The provision necessary for attaining this end is afforded in the design of the Dessau system of retorts, and, consequently, these retorts may be worked without attendant naphthalene troubles at higher temperatures than horizontal or inclined retorts. The reason why such higher temperatures are practicable in the Dessau vertical retort is lucidly stated in the claim already quoted from the patent specification.

According to this statement, the coal is subjected to distillation in a vertical retort heated to a higher temperature than is usually employed in gas manufacture, so that coke is formed from the internal walls of the retort inwards, and the gas generated passes inwards and upwards through the central portion of the charge. The central portion of the charge naturally is relatively cool until carbonization is all but completed, and affords a cool way by which the gas may pass upwards to the take-off pipes at the head of the retort, so that the gas is not subjected to superheating by incandescent surfaces. The retort is filled with coal up to the level to which it is heated in the setting, and, consequently, even in the small free space at the head or upper mouthpiece of the retort the gas is not subjected to the intense heat of incandescent retort walls. However high the heats employed in carbonization in the vertical retort may be, there is a relatively cool way through the core of the charge available for the escape of the evolved gas; and the alternative route for the gas through the outer circumferential layer of hot coke is practically blocked by reason of the impermeability of the coke caused by an initial deposition in its pores of fine carbon from the decomposition of the hydrocarbons of the tar and gas produced in the first few minutes after charging. The primary reason for the high temperature adopted from the outset in the Dessau system of vertical retorts was evidently that there should be a rapid formation of a crust of coke on the outside of the charge, and a rapid sealing-up of the crust with carbon particles deposited from the first portions of gas and tar produced. It was important that the crust of coke should be produced as soon as possible after charging, and that it should have the requisite impermeableness. To secure these desiderata an exceptionally high retort temperature was essential, and incidentally this proved helpful in carbonizing a charge which packed the retort full more quickly and more thoroughly than would have been the case with the lower heats which previously prevailed in retort-settings.

That the Dessau vertical retort is in practice heated to a higher temperature than was usually employed in gas manufacture at the time the Dessau master patent was filed (July, 1903) has been proved time after time by measurements of the temperature at different zones of the retort. For instance, in the first particulars published of the actual working of Dessau vertical retort settings given in a paper by Dr. Bueb in September, 1905 [" JOURNAL," Vol. XCI., p. 807], an initial retort temperature of 1400° C. (2552° Fahr.) is spoken of, and, again, it is said later in the same paper that a temperature of 1300° to 1400° C. (2372° to 2552° Fahr.) prevailed in the setting. In a report by Mr. E. Körting, the General Manager in Berlin of the Imperial Continental Gas Association, on the working of trial settings of Dessau vertical retorts at the Mariendorf works, published during February, 1906 [" JOURNAL," Vol. XCIII., p. 342], a statement is given of the actual temperatures in the flues of a setting, from which it appears that, on the average, the temperature of the bottom section of the vertical retorts was 1418° C. (2584° Fahr.), that of the next 1338° C. (2440° Fahr.), and that of the third section 1040° C. (1904° Fahr.).

Passing on to later measurements of temperature, Herr Prenger, the Manager of the Cologne gas undertaking, reported in 1908 that, in the large installation of Dessau retorts at his Ehrenfeld works, the temperature in the lower combustion chamber averaged rather over 1300° C. (2372° Fahr.), while at the middle of the height of the retorts it was 80° to 90° C. (144° to 162° Fahr.) lower [" JOURNAL," Vol. CII., p. 563]. In the same year, Herr Weiss, the Engineer of the Zürich gas undertaking, reported the temperatures which prevailed in different parts of the vertical retort settings at his works in the course of trials of the carbonization of a number of different varieties of coal in the vertical retorts. When the retorts were normally heated, he found that the temperature in the bottom section ranged from 1319° C. (2406° Fahr.) to 1388° C. (2530° Fahr.), and that in the middle section from 1276° C. (2329° Fahr.) to 1352° C. (2466° Fahr.) [see " JOURNAL," Vol. CII., p. 847]. Similar temperatures were shown in measurements made in other settings about the same time; but the foregoing figures, which are vouched for by gas engineers of the highest repute, will suffice for the present purpose.

It may be mentioned incidentally in this connection that, in the course of proceedings on the validity of the Dessau master patent in Germany (to which fuller reference will be made subsequently), it was contended by the opponents of the patent that the high temperatures mentioned in the claim were not actually used in practice; but this contention was over-ruled by the Judges of the Imperial Court of Justice in their decision. The heating of the retort to a higher temperature than was usually employed in gas manufacture at the time the patent was applied for, which is an essential feature of the Dessau process of carbonizatiou, may therefore be regarded as proved by reference to the practice in the actual working of Dessau settings. The gradation of the heat applied to the different sections of the retort from a maximum in the lowest section is another feature of the system, the reason for and value of which will be referred to later.

The Nature of the Tar.

The patentees also pointed out in their specification that an inconvenience of the making of coal gas by the methods hitherto practised was that the tar produced contained a considerable amount of carbon, of which not only was the gas deprived, but the value of the tar was reduced thereby; while objectionable thickening of the tar in the receiver or condenser was occasioned, and the work was interfered with or greatly disturbed by the occurrence of such tar. On the other hand, the tar produced according to the patentees' invention was stated to be substantially free from carbon proper, and to be liquid oil, technically pure, instead of being a semi-liquid mass difficult to handle and interfering with the work. It will be seen, therefore, that great importance was attached to the production of a tar containing relatively little free carbon. Free carbon necessarily is produced in small quantities by the breaking up of complex hydrocarbons, such as those which occur in the bituminous matter of coal, into the less complex gases which form the main constituents of coal gas. But there is no reason why the tar produced should contain the bulk of this carbon, or carbon particles carried over as smoke from the coal which is being distilled.

In the Dessau vertical retort, the gas produced from the whole of the charge, except the small quantity constituting the topmost layer, is caused to filter through the the partially carbonized inner portion of the charge before it reaches the gas exit at the top of the retort; and thus it is cleansed, and the greater part of the smoke and liquid or tarry products produced are removed from it. And similarly, the ungasifiable or not readily gasifiable tarry matter resulting from the carbonization of the coal has to percolate through a considerable length of the charge, and thereby

extraneous carbon particles and other solid matter are screened from it. Thus the tar produced is a tar properly so-called, as distinct from the mixture of naphthalene, free carbon, and water with a relatively small proportion of real tar, which constitutes the material, or so-called coal tar, produced from horizontal and inclined retorts as now ordinarily worked at high heats on gas-works. The Dessau vertical retort produces a true tar which is not subsequently contaminated by the solid particles of smoke, and is not destroyed by exposure to high temperature after it has been formed.

The presence of appreciable quantities of free carbon and naphthalene in tar may undoubtedly be regarded as proof that the bituminous constituents of the coal from which the gas is produced have been partially wasted, and that the proportion of the calorific value of the coal which is recovered in the gas produced is less than it would be in better and proper conditions of carbonization. Disregarding for the nonce the formation of scurf, it may be fairly said that the small amount of carbon which is inevitably liberated as such in the process of the gasification of the bituminous matter of coal may take refuge ultimately in either the tar or the coke. In the customary methods of working with horizontal or inclined retorts at high heats, the greater part of it is found in the tar, the quality of which is deteriorated by its presence. In the working of the Dessau vertical retort, on the other hand, practically the whole of the free carbon liberated finds its proper destination in the coke, the quality of which is improved through the closing of its pores by the carbon thus deposited *in situ*. The quality (and, to a small extent also, the quantity) of the coke produced are thus enhanced; while the quality of the tar separated at the same time is improved through the exclusion from it of the carbon particles liberated in the course of the gasification of the bituminous constituents of the coal. To sum up, the ideal state of things resulting from the carbonization of coal for gas making is that there should be produced:

1—A gas free from smoke, solid particles, naphthalene, and readily condensable vapours.
2—A liquid which is a true tar, and is nearly free from free carbon, or other solid constituents, or naphthalene.
3—A solid which is a hard, dense, and impervious coke.

This ideal state of things resulting from the carbonization of coal appears to be at the present time more nearly attained in the process of gasification as conducted in the Dessau vertical retort than in other carbonizing systems; and it is clear that the objects actually achieved by the Dessau process were clearly set forth in the master patent, which was lodged with the German Patent Office as early as July 29, 1903. The objects aimed at by the patentees had clearly not been attained by any procedure of earlier date; and there is no question that from the first practical trial of the process they were attained by it. It may perhaps be argued that the objects specified might, or could, have been attained earlier by anyone who took advantage of the knowledge acquired in research work on the decomposition of hydrocarbons, such as those which occur in coal or in the primary products of its dry distillation. But even if such an achievement had been accomplished, or had been possible in the laboratory, it remained for Dr. Bueb and his co-operators at Dessau to effect the objects aimed at in apparatus which was forthwith applicable to the larger scale of operations which practically prevails on gas-works, and at the same time not only to avoid any increase in the charges for labour and the general expenses of carbonization, but actually to effect, as will be indicated in the sequel, a substantial reduction of them.

Deductions.

The somewhat prolix account of the evolution of the Dessau vertical retort here given has been prepared with the object of indicating clearly that the invention covered by the master patent was not the mere lucky shot of a tyro in gas manufacture, but rather was the outcome and logical conclusion of several years of constant work and investigation on the subject. Of any work or researches contemporary with Dr. Bueb's, and not of a merely spasmodic or aimless character, practically nothing has been disclosed; and in regard to subsequent inventors and their achievements, it may be said, without disparagement of their efforts, that they have either had to be content to profit by the lessons which Dr. Bueb's investigations have taught, or have laboured under the disadvantage of having to start *ab initio* at a considerably later date, the while the small but all-important improvements of mechanical detail, &c., which make for perfection, have been elaborated in so far as the Dessau vertical retort is concerned. It will now be appropriate to indicate some of the practical results achieved in a few of the many installations of Dessau vertical retorts, starting with the two trial settings which were in continuous work at Dessau from June 1, 1905, onwards. After these practical results have been quoted, and their significance and relation to those obtained by other systems of carbonization discussed, the principles underlying the Dessau system will be more fully considered, and its novelty and independence of earlier processes will be demonstrated by reference thereto.

(*To be continued.*)

The Yorkshire Junior Gas Association will meet next Saturday at the Bradford Municipal Technical College, when Mr. William Cranfield will deliver an address on "Some Aspects of Pressure." This will be followed by a discussion on the general question of pressure.

GAS BILLS FOR 1911.

[Third Article.]

The measures introduced by Local Authorities for the coming session are, as usual, of widely varying importance so far as gas powers are concerned; but, nevertheless, all have their points of interest.

The first Bill falling for notice, in alphabetical order, is that of the Bedwellty District Council. They want to have the sole control of the supply of gas and water in their area of jurisdiction; and, with this object in view, they have to purchase the undertaking of the New Tredegar Gas and Water Company, Limited, and to have vested in them all the powers of supply. They also propose to make a little territorial arrangement with the Rhymney and Aber Valleys Gas and Water Company, whereby, under agreement, Council and Company may exchange certain portions of their supply areas; and furthermore, to round off the scheme, it is desired to acquire by agreement all or part of the undertaking of the Blackwood Gas Company, who are by their 1909 Act empowered to supply gas within an area which includes part of the administrative district of the Council. These are the main objects of the Bill, the clauses of which are of the usual form for conferring all necessary powers for carrying on the work and businesses of gas and water suppliers. [The water clauses may be passed over just for the present.] The limits of gas supply are described; and power is taken to maintain and extend the gas-works upon the present site. It is proposed that the price of gas shall not exceed 6s. per 1000 cubic feet. The prepayment meter clause comprises the addendum as to the Council being entitled to demand a deposit of 1s. a quarter for a slot meter, provided that the amount collected from the meter during the quarter shall be applied in the first place to refunding the deposit to the person who has paid it, and subject thereto the deposit is to belong to the Council. The standard illuminating power of the gas is to be 14 candles, tested by the "Metropolitan" No. 2 burner. In the financial section of the Bill, the Council ask for power to raise the money necessary for the purchase of the undertaking, and additional loans with the consent of the Local Government Board. It is requested that the period of repayment of the purchase money be 45 years. In subsequent clauses, it is seen that the Tirphil and Brithdir district is the portion of the area of the Tredegar Company that the Council wish to exchange for the Aber Bargoed and Pengam area of the Rhymney Company. After the exchange has been effected, public notice (as specified) is to be given that the transfer has taken effect. As to the purchase of the gas undertaking of the Blackwood Gas Company, power is proposed to be taken for this to occur at any time within a period of twenty years. Provision is made for the Mynyddislwyn Council, by giving six months' notice, to purchase the portion of the undertaking in their district on them obtaining the necessary powers. An alternative proposition regarding the Blackwood Company's concern is that the promoters may at any time, within a period of eighteen years from the passing of the Act, purchase the portion of the district of supply within their area of jurisdiction. The agreement with the New Tredegar Company forms the first schedule to the Bill. In it, it is observed that the consideration for transfer is £23,415 in cash, and the value of all stores above £200. If the Bill is not passed by Parliament in either the next two sessions, the agreement becomes void. [*Parliamentary Agents: Messrs. Baker and Co.*]

In an extensive Bill promoted by the Belfast Corporation, there is a clause arranging for differential gas prices in these terms:

> The Corporation may, notwithstanding anything to the contrary in the former Acts or in any Act incorporated therewith, charge differential prices as between gas supplied and used for private lighting purposes and gas supplied and used for any other purposes; and the price to be charged for such other purposes shall be such as may from time to time be agreed between the Corporation and the person to be supplied for such purposes. But in no case shall the price charged for gas supplied for such other purposes be in excess of the price charged for gas supplied for private lighting purposes; and the Corporation may provide such additional mains, pipes, meters, and fittings as may be requisite or necessary for enabling them to supply gas at differing prices for different purposes, and for measuring or ascertaining the quantity consumed for each such purpose.

In the financial part of the measure, power is sought to borrow in respect of the gas undertaking £100,000, repayable in fifty years. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Bicester District Council have a desire, which can be fully appreciated, for releasing the gas undertaking supplying in their district from that ill-favoured concern, the Mid-Oxfordshire Gas Company, Limited—one of the Preston group of promotions. It appears from the preamble of the Bill that the nominal capital of the Mid-Oxfordshire Company was £50,000, divided into 2500 ordinary shares of £10 each, and 2500 preference shares of £10 each. But out of this capital only 182 ordinary shares and 329 preference shares were subscribed. Notwithstanding the small amount of the subscribed capital, the Mid-Oxfordshire Company issued debentures to the total amount of £50,830, which debentures are secured by a general charge upon the undertaking of the Mid-Oxfordshire Company, and as regards certain portions thereof, are also secured by preferential charges on separate parts of the undertaking relating to the supply of gas in different towns, and representing the undertakings of several different Companies

acquired by the Mid-Oxfordshire Company. Debentures of the Company for a total sum of £4000 with interest are secured by a preferential charge on the Bicester part of the undertaking, and are further secured by a general charge on the whole undertaking of the Company. It is contemplated that the limits of gas supply shall be confined to the urban district. From the clauses dealing with the purchase, it is remarked that it is proposed that the price to be paid for the undertaking shall be ascertained by arbitration under the Arbitration Act of 1889; and the price to be paid by the Council to the parties entitled thereto is to be discharged within two months after the date of the award, provided that "in case of any doubt arising as to who are the parties entitled to the said price, or to any part thereof, the Council may, and shall, pay the amount thereof or of such part thereof (as the case may be) into the Bank of England in the name of the Paymaster-General for, and on behalf of the Supreme Court, to an account to be opened in the matter of this Act, and a receipt shall be given to the Council by the cashier of the said bank for the money which shall be an effectual discharge to the Council for the sum which in such receipt shall be acknowledged to have been received." The usual powers relating to the supply of gas are included, and following is a proposal for a maximum price of 6s. per 1000 cubic feet. The deposit provision appended to the prepayment clause to which attention is drawn in the review of the Bedwellty Bill is also included in this instance. The ordinary prescribed standard illuminating power of 14 candles is contemplated, using the "Metropolitan" test-burner No. 2. The Council desire to be authorized to raise the sum necessary for the purchase, and £500 as working capital; additional moneys being borrowed with the sanction of the Local Government Board. The suggested periods of repayment are forty-five years for the purchase money, and ten years for the working capital. It is intended that the accounts of the undertaking shall be kept separate from all others of the Council. [*Parliamentary Agents: Messrs. Baker and Co.*]

Dealing here only with the gas section of the Chesterfield Gas and Water Board's Bill, it is remarked that there has been borrowed in respect of the gas undertaking £199,693, of which on Sept. 29 last £68,152 has been paid off. Among the estimates of expenditure are for the gas undertaking £212 for purchase of land and wayleaves and £4288 for mains and pipes. Power to borrow this is requested, repayable in thirty years. The Board now wish for authority to extend their distribution system to the parishes of Barlow Calow, Duckmanton Temple, Normanton, and Wingerworth. The other gas clauses are all of ordinary form. [*Parliamentary Agents: Messrs. Stevens, Sons, and Parkes.*]

As is well known, since the advent of motor vehicles in the streets of London, numerous lamp-posts have suffered seriously from the uninvited attentions of such vehicles. The result is that the owners of the lamps are very desirous of having someone more substantial than the drivers upon whom to fix liability for damage. The Corporation of the City of London, in a Various Powers Bill for the coming session, wish to amend section 118 of the City of London Sewers Act, 1848, by inserting after the words "for doing such damage," this addition: "Or the party to whom any vehicle by which such damage may be done shall belong." With the explanation already made, the proposal will be clear. [*Parliamentary Agents: Messrs. Rees and Freres.*]

In a General Powers Bill, the London County Council propose to make it unlawful, except with their consent after consultation with the local authority, to retain, or erect upon, attach to, or extend from any building in the county of London:

(1) Any lamp or light (not used exclusively for public lighting), or any support, attachment, or erection used in connection therewith, or any part thereof which overhangs the public way, and which may be less than 7 ft. 6 in. from the surface of the public way immediately beneath, or extend more than 5 feet over and across such public way, or extend over any part of the public way which may be less than 2 feet from the carriage way.

(2) Any lamp or light (not used exclusively for public lighting) wholly or in part overhanging the public way which may exceed 84 lbs. in weight, or 5 feet when measured vertically or 3 feet when measured horizontally in any direction.

(3) Any sign, model, device, notice, word, letter, or representation in the nature of advertisement announcement or direction or any part thereof which may: (*a*) Overhang the public way or extend beyond the general line and exceed in dimensions 2 ft. 6 in. when measured vertically, or 6 feet when measured horizontally in any direction; or (*b*) Extend more than 6 inches over and across the public way, and be less than 8 ft. 6 in. from the surface of the public way immediately beneath; or (*c*) Extend more than 2 feet over and across the public way or more than 2 feet beyond the general line, and exceed in dimensions 2 ft. 6 in. when measured vertically or 2 feet when measured horizontally in any direction; or (*d*) Extend more than 4 feet over and across the public way, or more than 4 feet beyond the general line, or over any part of the public way less than 2 feet from the carriage way. [*Parliamentary Agents: Messrs. Dyson and Co.*]

In a General Bill, the Margam District Council seek power to supply gas and to provide for the transfer to them of as much of the gas undertaking of the Aberavon Corporation as is situate within the urban district of Margam. It appears from the preamble of the Bill that a large portion of the hamlet of Hafod-y-Porth, within the limits of gas supply of the Aberavon Corporation, is without a supply of gas; and there is no company or person authorized to supply gas through the remainder of the district. On these grounds, it is considered expedient that the supply of gas throughout the whole of the district should be in the hands of the Council. In addition to acquiring so much of the gas undertaking of the Corporation of Aberavon as is within the district, the Council desire to be empowered to erect new gas-works. Estimates that have been prepared for the purchase of land and the erection of works amount to £27,500. Referring to the clauses of the Bill to carry out these intentions, it is noticed that it is proposed that the Council shall serve on the Aberavon Corporation within six months after the passing of the Act notice of their intention to purchase. Lands are scheduled for new works, and power is to be taken to erect and maintain works. The proposed limit of price for gas of a prescribed illuminating power of 14 candles tested by the "Metropolitan" No. 2 burner, is 5s. per 1000 cubic feet. Among the financial provisions, authorization is sought to borrow the sum necessary for the purchase of the required portion of the works of the Aberavon Corporation, the sum of £27,500 for land and new works, and £1000 for working capital. The period of repayment suggested for the first two purposes is forty years, and for the working capital ten years. [*Parliamentary Agents: Messrs. Lees and Co.*]

Extended powers in relation to their gas undertaking are required by the Marple District Council. Among other things the extension of the gas-works is on the *tapis*. Associated therewith, the estimates quoted in the preamble are for the purchase of land £950, for the extension and improvement of the undertaking, and the construction of a weighbridge near the gas-works' entrance £4700, and for working capital £500. The necessary land and works powers are in the ordinary form; but it is proposed that the powers of compulsory purchase of land shall continue for five years, after which they are to cease. It is asked that the prescribed illuminating power of the gas be placed at 14 candles, as tested by the "Metropolitan" No. 2 burner. The shilling deposit per quarter addition is made to the prepayment meter provision. A stand-by clause on the Mountain Ash model appears. Authorization to borrow the sums already referred to is asked. It is proposed that the amount required for land shall be repaid in sixty years, the sum estimated for the extension and improvement of the undertaking in fifty years, and the amount needed for working capital in twenty years. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

In an Omnibus Bill promoted by the Rotherham Corporation, they are asking for a few powers in connection with the gas undertaking. Among the entries of estimates of money requirements is one amounting to £25,000 for the general purposes of the undertaking. The promoters desire the area of gas supply to be extended by the inclusion of the townships of Catcliffe Treeton and Wickersley. The Corporation ask for a 14-candle standard, as tested by the "Metropolitan" No. 2 burner, which will mean the repeal of some old standing provisions. On the Heywood lines, stand-by clauses are inserted referring to both gas and electricity. The remaining gas clauses are all of common form. The repayment period sought for the gas borrowing powers is forty years. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

An extensive General Powers Bill has been introduced by the St. Helens Corporation; and again there is a request for a change of the prescribed illuminating power standard to 14 candles, using the "Metropolitan" No. 2 test-burner. Accompanying several clauses of usual character, are stand-by clauses of the Heywood form for both gas and electricity. The following clauses refer to the supply of premises outside the area of supply:

Where it is proved to the satisfaction of the Local Government Board that the occupier of any premises outside the area of supply of the Corporation is desirous of obtaining a supply of gas from the Corporation, the Local Government Board may, if the local authority within whose district the premises are situate, and the company, body, or person (if any) authorized to supply gas to such premises consent, by order permit the Corporation to give a supply to those premises on such terms and subject to such conditions, as the Board think fit: Provided that if, in the opinion of the Local Government Board, any consent required by this sub-section is unreasonably withheld, the Board may proceed as if such consent had been given.

An order given by the Local Government Board under this section may, for the purpose of enabling a supply to be given thereunder, confer any such powers, and impose any such duties, on the Corporation as would have been conferred or imposed by the Gas-Works Clauses Act, 1847, or the Gas-Works Clauses Act, 1871, and as might have been conferred or imposed by Provisional Order if the premises and route along which lines are to be laid for the purpose of giving the supply were within the area of the Corporation, anything in any Act or Order relating to the undertaking to the contrary notwithstanding. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

There was a clause in the General Bill of the Halifax Corporation which proposed an amendment of existing legislation affecting the Gas Department, in order that the Gas Committee might have power to undertake the work of fixing, repairing, &c., of gas appliances. When the clauses of the Bill were under discussion by the Town Council last Wednesday, apparently this was considered to be an extension of municipal trading; and the clause was deleted.

Gas Patents Last Year.—Out of a total of 30,403 applications for patents filed at the Patent Office last year, including those which resulted in provisional protection only, there were, according to a calculation just made by Messrs. Stanley, Popplewell, and Co., Chartered Patent Agents, of Chancery Lane, 237 occurring under the heading of "Manufacture of Gas," and 6 under "Gasholders." The full numbers of applications for 1909 and 1908 respectively were 30,603 and 28,598.

LOCAL GOVERNMENT FINANCE.

The Taxation Returns Summarized.

THE concluding Blue-Book of the Annual Local Taxation Returns is Part VIII.; and it consists of a "Summary and Index" of the preceding seven volumes. Three of the earlier parts have been noticed in the "JOURNAL"—that is to say, those relating to Rural District Councils, Parish Councils, &c. (Sept. 13, p. 708), Borough Councils, other than Metropolitan Boroughs (Dec. 27, p. 916), and Urban District Councils (*ante*, p. 23). The present Blue-Book enables us to give some of the total figures for the twelve months to March 31, 1908.

The volume now before us completes the thirty-eighth annual series of returns issued by the Local Government Board, respecting the accounts of the various local authorities of England and Wales. The bodies whose financial transactions during the year 1907-8 are here summarized include all county councils, councils of municipal boroughs, councils of metropolitan boroughs, councils of urban districts other than boroughs, rural district councils, boards of guardians, the Managers of the Metropolitan Asylums District, the Receiver for the Metropolitan Police District, burial boards, harbour authorities not being commercial companies or private owners, authorities constituted for the purposes of the Unemployed Workmen Act, 1905, parish councils, overseers, and other local authorities who are authorized to levy, or order to be levied, rates, taxes, tolls, or dues, within the meaning of the Local Taxation Returns Acts, 1860 and 1877. The total number of the separate authorities embraced by this definition who had financial transactions during the year is 25,718. This is counting only once those of them who made separate returns respecting their transactions in different capacities. Particulars of the sums received and expended by the Metropolitan Water Board in the twelve months dealt with were published in a separate paper; and with a few trifling exceptions, none of the sums received or paid on income account by the Board are included in this summary, as no part of their income had been received from "rates, taxes, tolls, or dues." The receipts quoted include the sums received by local authorities from Government grants towards the expenses incurred in respect of elementary education, as well as the gross receipts from water, gas, electric lighting, tramways, and other undertakings carried on by them, and miscellaneous receipts from rents and sales of property and repayments on account of work done for private individuals. Money borrowed to meet capital expenditure is treated separately. The expenditure included is such as has been defrayed out of the receipts mentioned. In a footnote, the Blue-Book states that the number of local authorities who had expenditure (other than that defrayed out of loans) during the year 1907-8 in respect of water supply was 1144, of gas supply 222, of electric light supply 235, and of tramways and light railways 153.

The total amount of public rates received in the year 1907-8 was £59,627,577, of which 25·2 per cent. was collected in areas in the Administrative County of London. This total exceeded that for the previous year by about £70,000. The receipts also included £20,629,133 from Exchequer grants (including local taxation duties), £23,696,274 from gas, water, electric light, and tramway and light railway undertakings; and £15,471,464 from other sources. At the beginning of the year under review, the total of the gross value or gross estimated rental of the rateable hereditaments in England and Wales was £258,905,070; the total rateable value was £209,891,680 (including £23,662,160, the rateable value of agricultural land); and the total assessable value for purposes of the Agricultural Rates Act, 1896, was £198,060,600. Taking England and Wales as a whole, the gross value or gross estimated rental increased between the commencement of the year 1906-7 and that of 1907-8 by £4,017,549, or 1·6 per cent.; and the rateable value, by £2,824,005, or 1·4 per cent. The average amount of public rates per pound of assessable value for the year 1907-8 was 6s. 0·25d., as against 6s. 1·22d. in the previous year, or a decrease of 0·97d. Calculated on the estimated population, the amount per head was £1 14s. 2d., compared with £1 14s. 6d. for the year before, or a decrease of 4d. The Exchequer grants amounted to 1s. 11·7d. per pound of rateable value, and 11s. 10·4d. per head of the estimated population. In the year dealt with, there were 150,471 miles of highways maintained by local authorities in England and Wales.

From the section of the Blue-Book which is devoted to the subject of borrowing, it is gathered that the loans raised by local authorities during the year 1907-8 amounted to £21,417,031, which was more by £1,023,130 than the sum raised in the preceding year, but was smaller than the corresponding figures for any other year since 1898-9. The amount of loans received in the twelve months for gas-works was £498,708, as compared with £358,357 in the preceding year; for water-works, £2,896,660, against £2,530,891; for electric lighting, £1,328,026, against £1,525,631 in 1906-7, and £2,552,827 in 1905-6; and for tramways and light railways, £3,658,402, against £3,194,190. There was also a small item of £12,587 under the heading of public lighting. It will be seen, with regard to electric light undertakings, that the falling off in the amount received on loans is a very considerable one when comparing the year 1905-6 with 1907-8. The amount of loans outstanding increased during 1907-8 by £9,158,104, a smaller sum than any annual increase that took place between the years 1896-7 and 1907-8. The total amount of outstanding loans at March 31, 1908 (including £48,123,038 for the Metropolitan Water Board) was £503,645,616; and the amount standing to the credit of sinking funds and other similar funds applicable towards the repayment of such part of this balance as was repayable by means of those funds was £18,420,617.

The total of outstanding loans at March 31, 1908, as already mentioned, was £503,645,616; and the relative proportions in which this was distributed over the various purposes for which it had been borrowed, are as follows: Baths, cemeteries, electric lighting, gas-works, harbours, docks, piers, canals and quays, markets, tramways and light railways, and water-works, £268,586,687, or 53·3 per cent. of the whole; elementary education (including industrial schools), £39,370,949, or 7·8 per cent.; highways, bridges, and ferries, and sewerage and sewage disposal works, £100,087,907, or 19·9 per cent.; other purposes, £95,600,073, or 19 per cent. Dividing the amounts still further, it is seen that £23,358,045 relates to gas-works; £122,547,302 to water-works (including the £48,123,038 for the Metropolitan Water Board and £1,027,929 of the Derwent Valley Water Board); £28,666,541 for electric lighting; and £33,300,113 for tramways and light railways. The average amount per pound of rateable value, over England and Wales, of the total loans outstanding is £1 5s. 8d. (including the Water Board loans) for undertakings which are revenue bearing, and £1 2s. 5d. for loans for all other works and purposes; the average amounts per head of the estimated population being respectively £7 13s. 9d. and £6 14s. 6d.

The total receipts of the local authorities in 1907-8, excluding loans, amounted in all to £119,424,448. Some of the items are as follows: Gas-works, £7,648,814; water-works, £4,768,338; electric light undertakings, £3,403,887; tramways and light railways, £7,875,235. It is pointed out in the Blue-Book that the revenue of tramway and light railway undertakings carried on by local authorities is shown in the returns as having increased from £7,115,789 in 1906-7 to £7,875,235 in 1907-8. The corresponding increase in the case of electric lighting undertakings was from £3,094,989 to £3,403,887; and in the case of gas supply undertakings, from £7,150,028 to £7,648,814. The total expenditure, excluding loans, was £118,727,368; and among the items of which this total is made up, the following may be mentioned: Gas-works: Maintenance and other expenses, £5,624,989; loan charges, apportioned as far as practicable, £1,473,144; total, £7,098,133, or 6 per cent. of the total expenditure. Electric lighting (other than public lighting): Maintenance and other expenses, £1,292,730; loan charges, £1,990,421; total, £3,283,151, or 2·8 per cent. Public lighting: Maintenance and other expenses, £2,184,313; loan charges, £24,467; total, £2,208,780, or 1·9 per cent. Water-works: Maintenance and other expenses, £1,788,837; loan charges, £3,462,981; total, £5,251,818, or 4·4 per cent. Tramways and light railways: Maintenance and other expenses, £5,155,948; loan charges, £1,876,984; total, £7,032,932, or 5·9 per cent.

Referring to the returns furnished to the Local Government Board by the councils of county boroughs and other municipal boroughs only, the Blue-Book states that it would seem that a large proportion of the tramway and light railway, water supply, gas supply, and electricity undertakings owned by these councils were during the year 1907-8 carried on without deficiencies in the revenues which were met by transfers from rates or other accounts. The numbers of such undertakings were: Tramways and light railways, 65; water supply undertakings, 160; gas supply, 101; electricity supply, 119—a total of 445. From these undertakings, surplus revenue to the extent of £1,056,210 was transferred to other accounts of the councils in relief of the rates; the proportions being: Tramways and light railways, £333,445; water supply, £116,254; gas supply, £484,659; and electricity supply, £121,852. On the other hand, the returns also show that in the case of 25 tramways and light railways, 44 water supply undertakings, 4 gas-works undertakings, and 29 electricity supply undertakings carried on by town councils, sums were transferred during the year from rate accounts or other accounts of the councils to meet deficiencies in the revenue of the undertakings. The total of the sums so transferred to meet deficiencies in the year 1907-8 was £321,466.

Chlorine and Water Purification.—In his monthly report to the Reading Town Council, Mr. Leslie C. Walker, the Manager of the water-works, states that Dr. J. C. Thresh and Dr. J. F. Beale recently visited the works, and, having thoroughly examined the new system of filtration in use there, as described in the paper read by him at the last meeting of the Association of Water Engineers, and noticed in the "JOURNAL" for the 27th ult., expressed themselves entirely satisfied with the working and with the results obtained. Dr. Thresh wrote that, being the first in this country to realize the possibilities of chlorine as a water-purifying agent, and to demonstrate the destructive effect of very minute quantities on the bacilli of typhoid fever and cholera, he was greatly interested in the results obtained by Mr. Walker with the De-Clor process. Mr. Walker had not only solved the water-purification problem for Reading, but had set an example which, sooner or later, would be followed throughout the civilized world. He congratulated Mr. Walker (and Messrs. Candy and Co.) on a success which he had amply verified by bacteriological investigations. Dr. Beale also offered congratulations on the excellent results of the process.

GAS LIGHTING OF RAILWAY CARRIAGES.

All deplore most sincerely loss of life in connection with railway disasters; and there is cause for equally deploring the eagerness, marked by some spite, of electrical people to try to make capital out of these occurrences, on insufficient grounds, in favour of a change of the lighting system from gas to electricity. It is supposed—it is all supposition—that gas takes an awful part in the effects of a train disaster; but, as was shown recently in our editorial columns, it is pretty certain that in the case of the wrecking of a train, before the conveyed gas could take any part in subsequent scenes of the disaster, it would be liberated, and past all contributory power. Our electrical friends refuse to give even the slightest consideration to the practical phases of the question. The visionary side furnishes, in their opinion, sufficient strength for their case. It matters little to them that the technical experts of our railway systems have fully considered the whole matter, and that they are not less thorough and humane than electrical journalists and propagandists.

The view of the railway technical expert finds expression in some remarkable statistics compiled by Pintsch's Patent Lighting Company, Limited; and these statistics have world-wide application, and therefore reflect world-wide railway expert opinion. The figures for Great Britain and Ireland have been corrected to Sept. 30, 1910; and it is seen that the number of railway carriages fitted for gas lighting at that date was 46,328. This cannot be compared with the figure of 20,459 for the year 1908, as between the dates of compilation the Company took over the working of the Pope system, and the figure for this has been included in the latest statement. The following table is the most up-to-date compilation of the position of gas lighting on the Pintsch system on the railways of the world. In reference to the 1909 figures, those for Great Britain, Egypt, Argentina, India, Australia, and Japan are corrected to the end of September last. If all the figures could have been brought up to date, the increase shown would have been more remarkable still:

Name of Railway.	1908.		1909.	
	Number of Carriages Fitted.	Number of Locomotives Fitted.	Number of Carriages Fitted.	Number of Locomotives Fitted.
Germany	52,846	7,958	56,622	8,680
Denmark	45	..	45	..
Great Britain and Ireland	20,459	..	46,328	..
France	11,914	..	13,312	..
Holland	3,978	5	4,062	5
Italy	1,552	..	1,582	..
Switzerland	398	2	398	2
Portugal	67	..	179	..
Spain	38	..	280	..
Austria	6,465	..	7,179	..
Russia	4,428	329	5,129	347
Sweden	994	67	1,196	67
Servia	219	..	219	..
Bulgaria	154	..	179	..
Turkey	119	..	119	..
Egypt	382	..	623	..
United States of America	31,349	..	32,119	..
Canada	1,626	..	1,341	..
Brazil	1,324	31	1,334	31
Argentina	1,548	127	1,625	197
Chili	46	..	46	..
India	13,686	60	14,621	156
Australia	2,945	..	3,311	..
Japan	180	..	621	..
Norway	..	..	1	..
Totals	156,868	8,579	192,471	9,485

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Midland Junior Gas Engineering Association was held on Saturday, at the City of Birmingham Technical School—Mr. R. S. Ramsden (Burton-on-Trent) presiding.

A Vote of Condolence.

Mr. R. J. Rogers (Birmingham) said that before they commenced the business he had a sad duty to perform, and that was to propose a vote of condolence with Mrs. Rothwell and her family in the loss they had sustained by the death of Mr. Harry Rothwell, a member of the Council of the London and Southern District Junior Gas Association. Mr. Rothwell was well known to many of the members of their own Association; and whenever any of them went to London, or desired information on any subject, he was only too pleased to assist them in every way.

The vote was passed by the members rising silently in their places.

The Development of Incandescent Gas Lighting.

Mr. W. J. Pickering (Birmingham) then read a paper on the "Development of Incandescent Gas Lighting," an abstract of which, together with a report of the discussion to which it gave rise, will be found on p. 156. The paper was illustrated by numerous lantern slides; and there were also on view many samples of appliances used in connection with gas lighting, &c.

The President, at the conclusion of the paper, proposed a hearty vote of thanks to Mr. Pickering for all the trouble he had taken.

The Hon. Secretary (Mr. G. C. Pearson), in seconding, remarked that the author had worked hard in the preparation of the paper, and had to a great extent been at a disadvantage, owing to its coming on just at the very busy time of the year.

The vote was carried with applause, and acknowledged by Mr. Pickering.

A Coffee Meeting.

At the conclusion of the formal proceedings, a Coffee Meeting was held at the Metropole Café.

CARBONIZATION IN VERTICAL RETORTS.

By J. S. De Hart, Jun., of Newark, N.J.

[A Paper read at the Meeting of the American Gas Institute.]

This paper gives a short description of an experimental bench of vertical retorts on the Woodall-Duckham system of continuous carbonization at the station at La Grange of the Western United Gas and Electric Company of Aurora, Illinois. It was built practically on the plans of the experimental bench at the Nine Elms station of the Gaslight and Coke Company, with the idea of studying the working of American coals in American retorts.

The bench consists of four retorts, 25 feet long, oval in section, 9 in. by 21 in. at the top, 20 in. by 29 in. at the bottom, heated by a producer with twin grates and twin charging-holes, all supported on a steel platform 10 feet above grade. The upper mouthpieces are fitted with separate feeding-drums, each operated at a speed to keep the retorts full of coal. The lower mouthpieces of each retort are fitted with a coke-extractor and revolving drum. The speed of the extractor controls the carbonization in each retort. The feeding-drums make three-quarters of a revolution a minute, the coke-extractors make three-quarters of a revolution an hour, and the drums discharge four times an hour.

The bench is located at one end of the retort-house, and is either run in connection with horizontal benches or alone, as the gas supply will allow. Retort-house governors control the pressure for each system. Coal is passed through a small crusher, and raised by an elevator to a storage-bin above the retorts. The coke is taken away from the bench in wheelbarrows. A small vertical engine runs the feeding-drums and extractors.

The heating of the bench is very simple. All the producer gas goes directly to the top of the combustion chambers; where it is distributed by four dampers. The furnaces have angle-iron grate-bars and step-grates for the supply of water; but, in addition to the above, steam is used and measured by discs and a regulating valve. The furnaces are cleaned once every 48 hours, and are practically free from clinkers. Secondary air passes through a recuperator in the back wall of the bench across the bottom, and is distributed to the top and middle of the combustion chambers by four dampers. When the proper distribution is obtained, the main stack damper controls the heats. All the fire-brick material, with the exception of three retorts, was made in America. The three retorts are machine-made, and were imported from England.

The bench was completed about Sept. 1, 1909, and was operated until Feb. 1, 1910, the greater part of the time in conjunction with the old benches. The bench was not protected from the weather until late in the winter, and the coal available was taken directly from the cars in a more or less unsatisfactory condition at times. In November it was possible to shut down the horizontal benches for ten days, during which time the following average results were obtained from Youghiogheny coal:

Coal used	20,151 lbs.
Coke made	14,841 ,,
Generator fuel	3,598 ,,
Gas made	108,637 cub. ft.
Yield of gas per pound of coal	5·39 ,,
Coke yield, proportion of coal	73·60 p. ct.
Generator fuel, proportion of coke made	24·30 ,,
Generator fuel per 100 lbs. of coal	17·89 lbs.
Illuminating power on Sugg's "D" argand burner	14·47 candles.
Calorific power, gross	609 B.Th.U.
Candle-feet	77·91

The data are not so complete as we would like; but the figures may be of interest to the members. It was impossible to maintain proper temperature conditions in the foul main and condensing apparatus; and the gas passed through a relief holder in going from the condensers to the purifiers. Dew-points were not taken at the works during this test; so that the candle-power corrections are for 60° Fahr. only.

While these results were fairly satisfactory, taking into consideration the conditions under which the plant was run, the top labour and the leaky drums were a constant source of trouble for uniform operation. The horizontals were again shut down in January, 1910, for ten days, during which time we experimented

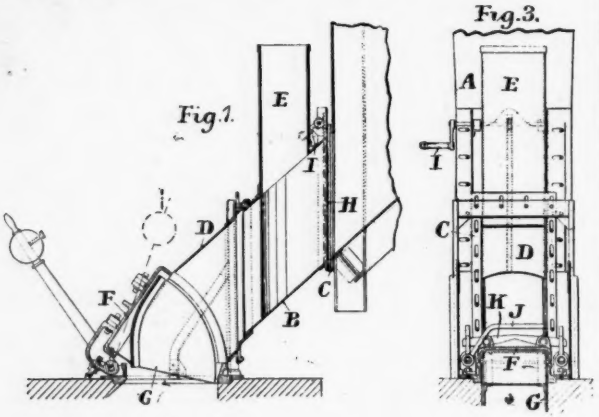
with the heating of the bench as much as the design would permit, with the idea of eliminating the bridging at the top; so that no reliable data were taken at this time, except to get a general line on the tar and ammonia in the gas. This would indicate that we can safely anticipate 7 lbs. of ammonia and 14½ gallons of tar per ton of coal carbonized.

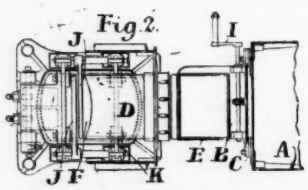
After shutting down the bench in February, it was decided to remove the revolving drums, and substitute cast-iron hoppers and balanced self-sealing doors. The bench was again started in August, 1910, with the hope that it would be possible to shut down the horizontal benches for a considerable time. It has been impossible to do this, however; so that the vertical bench is now running in conjunction with the horizontals. The hoppers and self-sealing doors are extremely simple to operate, and are discharged once an hour, requiring less than one minute, and are absolutely gas-tight. There is still considerable bridging at the top; but changes are under way which it is hoped will practically eliminate this trouble, even with the high-volatile Youghiogheny coal. We could undoubtedly eliminate a great deal of trouble of sticking in the top section with a low-volatile coal; but up to the present time we have devoted all of our attention to the successful carbonization of the high-volatile coal such as is more generally used by gas companies.

SMOKE-GUARD FOR CARBONIZING CHAMBERS.

The Compagnie Générale de Construction de Fours, of Paris, have taken out a patent for a device for use in connection with charging carbonizing chambers, whereby the smoke and flames issuing therefrom are conveyed into a chimney, and so rendered incapable of causing inconvenience and possible injury to the workmen.

The general arrangement is shown in the accompanying illustrations; fig. 1 being a vertical section of the top portion of a chamber fitted with the device, fig. 2 a plan, and fig. 3 a vertical section of fig. 1.





It will be seen from fig. 1 that the charging hopper A is extended at the lower part by an inclined pipe B, connected on one side to the framework C of the hopper, and on the other to the pipe D. This pipe has on its upper side another, forming a chimney E. F is a damper, worked by a counterpoised lever, and provided with a hood G, which, when the damper is open, cuts off the passage on each side of it, so that the smoke and flame from the furnace can only pass through the pipes D and B into the chimney. The stokers are thus protected from accident. The hopper is furnished at its outlet end with a vertical trap-door H, carrying a rack, into which gears a pinion, the shaft of which is supported by blocks fixed on the framework. By turning the handle I, the trap-door can be raised or lowered, and the stream of coal regulated. After the coal has passed under the door, it is conveyed into the chamber without any possibility of missing the opening into it. During the process of charging, as long as the damper remains open, the smoke and other products of combustion issuing from the chamber are caught by the pipes D and B, flow into the chimney E, and pass away.

In designing their arrangement, the patentees have made provision for any alteration in the relative positions of the hopper and the setting due to the expansion of the latter; and details in regard to this are given in the specification. They claim for their device that it effects the conveyance of flame, noxious fumes, and products of combustion away from the place where they are likely to be dangerous to the workmen; that it facilitates the charging of the chamber without any escape of coal; and that it provides a remedy for expansion of the setting, in whatever direction it may occur. The chamber is hermetically closed in the ordinary way—viz., by the lever J being pulled down on to the damper F, which, by means of the cross-bar K and the other mechanism shown in figs. 2 and 3, is pressed firmly upon its seat.

THE DEVELOPMENT OF INCANDESCENT GAS LIGHTING.

By Walter J. Pickering, Central Laboratory, Nechells, Birmingham.

[A Paper read before the Midland Junior Gas Association, Jan. 14.]

Introducing his subject, the author said: It would be altogether beyond the scope of a paper such as this to attempt to deal in detail with all the steps by which gas lighting has attained to its present position as one of the most important assets of our social life. But if we endeavour to survey briefly its course of development, and touch upon a few of the causes which have helped to bring this progress about, I think it will be interesting to those who cannot claim to have had a share in the pioneer work.

After a brief survey of the early history of gas lighting, he continued: Much work was done with regard to the construction of the lanterns and burners for street lighting, and upon the effect on flames of heating the gas and air supplies. But precisely what the future of gas would have been without another great invention, it is not difficult to see. The allusion is, of course, to the gas-mantle, the introduction of which was undoubtedly the salvation of gas lighting. The introduction of gas lighting by Murdoch was a revolution; and the application of electricity to lighting purposes was destined to work another revolution. Gas was to go among the obsolete things like the rushlight and the candle, and the tiresome lamp that always needed attention. The men whose money was invested in gas saw the reward of their enterprise about to be swept away. The world of gas was visibly perturbed. But at this point, Baron Auer von Welsbach, seeing a stage in human achievement never before attempted, originated the incandescent mantle; and by its aid gas gave a light infinitely superior to electricity. The date of Welsbach's first patent was December, 1885; and the mantle was first placed on the English market in February, 1887, when the public were invited to inspect an installation of 56 lamps at the Marlborough Gallery, Pall Mall. The incandescent mantle not only gave gas a new lease of life, but founded what is an interesting industry in itself.

Some particulars followed regarding the manufacture of gas mantles; and then the author proceeded to deal with

Non-Collodionized Mantles.

He said: No doubt, you are familiar with the soft or non-collodionized mantle, which has a big future before it. Already it has come into fairly general use. In Germany, the use of this mantle for the maintenance of private installations is very common; and it is now also being used very considerably in that direction in this country. I am informed that the Gaslight and Coke Company use soft mantles entirely for their maintenance work. This type of mantle was introduced into this country by Mr. Corbet Woodall, as a result of observation of the excellent results obtained with it in Berlin, where the average life of mantles in the public lamps in some districts is 1000 hours, with never a defect to be observed.

Low-Pressure Gas Lighting.

Various modifications in burner construction, with increased efficiency in consequence, followed the introduction of the mantle. Welsbach had at first to take the bunsen or atmospheric gas-burner as he found it; his assistant mechanics merely adapting the laboratory bunsen to the novel purpose, and not realizing that it was capable of considerable improvement. The Kern burner was introduced; and being made to carry more primary air and also effect a better mixture than the ordinary bunsen, it gave better results than the latter. A burner of the ordinary "C" type, with properly-adjusted air supply and a good mantle, will give an efficiency of about 21 candles per cubic foot of gas; while the Kern burner, without chimney, gives 25 candles per cubic foot. Even at low pressures, however, greater efficiency than this may be obtained with an upright burner without any other device than good mixing of the gas and air. The "Visso" burner, which is suitable for pressures from 0·5 inch to 3 or 4 inches, gives an efficiency —from actual tests—of very nearly 30 candles per cubic foot, and, moreover, is quite small compared with other burners of equal power. The following figures of flame-temperatures with different burners, with gas at a pressure of about 23-10ths, may be of interest. "C" burner: Near inner cone, at hottest portion of the flame, 1360° C.; in middle of the flame, 1100° C.; and at the tip, 850° C. Méker burner: On the gauze, 1460° C.; ½ inch above it, 1400° C.; 1 inch above it, 1350° C.; 1½ inches above it, 1230° C.; and at the tip of the flame, 1100° C. "Visso" burner (upright): Near gauze, 1590° C.; above gauze (centre), 1550° C.; and at the tip of the flame, 1500 C. The use of upright incandescent burners

led to the introduction of proper shades or reflectors for indoor lighting, since otherwise the larger proportion of the luminous effect was in an upward direction.

Next came the inverted burner, which was little known before the Earl's Court Gas Exhibition of 1904. At this exhibition, quite small burners were exhibited, each giving a light of 20 candles for a gas consumption of 1 cubic foot per hour, with much artistic effect. The light was shadowless, and shone brightest in the downward direction. Burners of the inverted pattern, consuming 3 to 3½ cubic feet of gas per hour, and yielding some 100 candle power, are much used for indoor lighting; while the longer life of the mantles, owing to the more favourable method of suspension has led to the adoption of this principle for the lighting of railway carriages, where it has succeeded very well indeed, in spite of the oscillation.

The lighting of such public buildings as churches may be admirably effected with low-pressure burners of either type. The inverted gas-burner, arranged in cluster form in one lantern, has lent itself well to street lighting, and was so used in this town on the refuges, both in the centre and suburbs, before the introduction of high-pressure lighting.

Mantle Maintenance.

Before leaving the subject of low-pressure lighting, I should like to dwell briefly on the question of mantle maintenance as regards this system. In this connection, figures are of very little value unless they are based upon a large number of tests, or on wide experience with one or many makes of mantles. Let me quote some remarks on the subject by Mr. F. W. Goodenough before the Illuminating Engineering Society last November:

Everything depends upon the local conditions under which the mantle is used. It may, however, be stated as a general proposition, founded upon a large number of tests, that if the burner receives such periodical attention as it would from an ordinary qualified maintenance fitter, a mantle that would pass a gas company's tests will not sensibly diminish in candle power in 500 hours, and will not lose more than 10 per cent. in 1000 hours of burning. The average of some tests made some time ago of vertical mantles, tested on the horizontal, shows a drop of 7 per cent. after 806 hours' burning. In actual practice, the efficient life of a mantle on a burner properly maintained averages from about 500 to 600 lighting hours in public lamps. The best on record that I know of was a mantle that gave a good light in a lamp in St. James's Park for two years—say 8000 lighting hours—and became an object of affection to the lamplighter, who was quite grieved when the mantle at last broke down. In most private installations, including factories, public-houses, and other premises where the percentage of breakages from external causes is highest (and which are the first to be placed under contract when such a service is offered by a gas company), the average life is about half the before-mentioned number of lighting hours; leading to an average use of about five to seven mantles per burner per annum. In residences, on the other hand, the average life is generally higher than in public lamps. It is not an uncommon thing to find a mantle to last twelve months in a private house.

Very often, where burners are situated in sheltered positions and not subjected to much draught or vibration, the life of the mantle is determined by the need for cleaning the burner.

The plan adopted by some gas companies of contracting for maintenance work has many advantages. Attention is given to burners, glassware, and mantles; and the consumer knows beforehand his cost for upkeep. The Gas Department of our city undertakes the cleaning and adjustment only of incandescent gas-burners for a nominal quarterly charge; mantles and glassware being charged for as used. The Department is always willing to give expert advice as to the lighting of premises with a view to securing the maximum of light at the minimum of cost.

Testing Mantles.

Almost every large gas company conducts regular tests of mantles supplied for use on maintenance work, so that the quality of contract consignments may be watched. Tests for life and lighting value are made, and also the power of the mantle to withstand shock. The latter test may be carried out in a patent mantle-tester invented by Messrs. Woodall and Moon. [One of these machines is on the table before you.] Both vertical and inverted mantles may be tested. The machine is driven by a small water wheel at usually thirty revolutions of the spindle per minute, and a succession of shocks, numbering eight for every revolution of the spindle, is transmitted to the burner and mantle, while also the gas is alternately lighted and extinguished.

In making an actual test, the required burner and mantle are fitted on the machine; the gas is turned on and lighted; and the mantle is allowed a short time to harden. After this is done, the hands of the index are set to zero, and the machine is started. It should then be run with the light weights on it, and the mantle observed to see when it shows signs of breaking. Should the mantle stand the test with the light weights, it will then be necessary to put on successively heavier weights until the most satisfactory weight for testing the mantle is arrived at. It will be found that weights of about 2 oz. are the most satisfactory for general use. If desired, the mantles can be tested to destruction either with the shocking and lighting and extinguishing simultaneously, or, if preferred, the gas can be extinguished and the machine used only for giving shocks to the mantle.

High-Pressure Gas Lighting.

This subject is one full of interest at the present time, when our large towns are waking up to the fact that the street lighting of a few years ago is still capable of further improvement. The increasing fast motor traffic makes good lighting of our main streets a vital necessity, in order to ensure safety for pedestrians. By reason of its great efficiency, the inverted burner is in the forefront as regards lighting by high-pressure gas. Its efficiency is due chiefly to its high flame-temperature, achieved by more perfect mixing of gas and air, and the heating of the mixture prior to reaching the point of combustion. The fact that with this type of burner the useful lighting rays are largely transferred to below the horizontal, enhances its applicability to street lighting.

Column supported lamps, with gas at 80 to 100 inches (water-gauge) pressure, and an efficiency of 70 candles per cubic foot, giving maximum illumination at angles of 10° to 40° below the horizontal, are coming into use. Birmingham has already some of these high-power units of light. Berlin has for some time deservedly held place as the best lighted city in the world, and has been an object-lesson for many deputations bent on investigating the relative merits of different systems of street lighting. In 1909, an interesting report was published relating to street lighting in the City of London.*

The Streets Committee sent a deputation in March, 1909, to inspect the street lighting in various Continental cities. Eight cities were visited, and the observations embodied in the report mentioned. Berlin occupied a considerable space; and among the remarks made concerning it, may be mentioned the following:

High-pressure gas lighting is very largely and effectively used; 25 miles of street being lighted by 1531 lamps. The deputation was informed that the Berlin authorities have decided to spend seven million marks (£350,000) in installing the latest patterns of high-pressure gas-lamps with inverted burners, in lieu of the existing gas and electric lamps. Expenditure in this direction has been going on for two years, at the rate of £50,000 a year, and will be continued at the same rate for the next five years. The lamps used are graded, according to the importance of the thoroughfares, from 4000 to 200 candle power.

In the "Journal of Gas Lighting" for Nov. 22 last, there appeared an article on the "Public Gas Lighting of Berlin," some facts from which are worth bringing to your notice. The total length of the streets lighted by gas is 313 miles, as against only 19 miles by electricity. Within the last five years high-pressure gas lighting has gained about 27 miles of streets; while the electric light was extended on no more than 1½ miles. It is entirely due to the inverted high-pressure system of incandescent lighting that this marvellous progress has come about. The first inverted lamp (a two-burner Graetzin low-pressure one) was introduced in Berlin in 1906, and by the end of 1910 there are gas-lamps with a lighting power of upwards of 8 million candles, of which 62 per cent. is produced by inverted low-pressure and high-pressure lamps. Upwards of 90 per cent. of the lamps are of the Graetzin type. While speaking of the lighting of Berlin, it is curious to note that during December, 1910, about 500 low-pressure inverted lamps, each of 600-candle power, have been installed. The result of this installation of high candle-power low-pressure lamps will no doubt be viewed with interest by lighting authorities in this country.

Turning now to the lighting of the City of London, it is interesting to note the progress which has been made since the report of the deputation above mentioned. The report observed that, "before suggesting any drastic alterations in the general lighting of the City, the Streets Committee should be authorized to arrange for some further experimental lighting of the City thoroughfares." Accordingly, the Committee invited and received proposals from the Gaslight and Coke Company and from the City of London Electric Lighting Company to experimentally light various areas of the city by the most improved methods and appliances, having special regard to the terms of the first recommendation as to the lighting of the streets "by means of centrally hung lamps with lowering gear," to obviate the necessity of bringing large tower ladders into crowded thoroughfares to attend to the maintenance of this special kind of lighting.

The Gaslight and Coke Company proposed a scheme of centrally hung high-power gas-lamps fitted with gear for drawing the lamps from the centre of the roadway to the fronts of the houses, and lowering them to the footpath for cleaning and remantling; the winches being fixed on the walls of the buildings in the side streets for preference, to prevent any obstruction in the main thoroughfares. The lamps were to be fixed, wherever possible, at the intersections of the side streets with the main roads, so as to light both thoroughfares, and dispense with the smaller lamps in the side streets. The Company decided upon the eastern portion of Cannon Street, between Dowgate Hill and King William Street (about 300 yards of street), and proceeded to install compressing plant in one of the arches under the latter thoroughfare and erect seven centrally hung high-power gas-lamps of 1500-candle power of the Keith-Blackman type, with new pattern lantern; a 6-inch main being specially laid for the purpose, and the gas being compressed to between 70 and 80 inches (water-gauge). The height of the lamps is about 26 ft. 6 in. above the centre of the roadway, which is some 50 feet in width; their average distance apart being about 105 feet. Two additional lamps have had to be fixed on posts on refuges at either end of the thoroughfare—making nine lamps in all.

In New Bridge Street, the Gas Company have put up six high-pressure gas-lamps of 1500-candle power on standards, without lowering gear. The columns are on the footpath, with one small traffic lamp on the refuge in the roadway; the light being about 16 feet from the ground. The lamps are of the Keith-Blackman type, supplied with gas at about 70 inches pressure from an ad-

* See "Journal," Vol. CVII., pp. 175-181,

joining compressor-house. Lamps of the kind just mentioned are stated to give an efficiency of at least 60 candles per cubic foot of gas, working at a pressure of 54 inches water column.

With regard to our own city, high-pressure lighting is yet only just being installed. In May, 1910, at the National Trades and Industrial Exhibition in Bingley Hall, the Gas Department took advantage of the opportunity to demonstrate the efficiency of modern methods of high-pressure gas lighting. The scheme was arranged by the Fittings Superintendent (Mr. S. R. Barrett). Four systems were represented; and the results obtained were somewhat of a revelation to manufacturers and factory owners in the district. The lighting of the 65,000 square feet of floor space was obtained at a cost of 4s. 5½d. per hour, with gas at 1s. 11d. per 1000 cubic feet; the total illumination being 112,650 candles. The figures for mantle maintenance were evidence of the great economy that can be effected in this respect in the case of a well-fitted installation. Two mantles per burner covered the whole cost of renewals during the period the exhibition was running (about ten weeks), including the unavoidable breakages which occurred during the trial lighting in the few days before the official opening. With such an exhibit as this, efficient ventilation was, of course, a very important point; and this was catered for by fixing fifteen ventilators in all, each delivering foul air from the apex of the roof at the rate of 28,300 cubic feet per hour.

The efficiencies claimed by the various systems were as follows: Messrs. Thomas Glover and Co., Limited, Sale-Onslow system, 40 candles per foot, upright burners. The James Keith and Blackman Company, Limited, 60 candles per foot, inverted burners. Messrs. William Sugg and Co., Limited, 45 candles per foot, inverted burners. "Ovee" Light Company, 50 to 63·8 candles per foot, inverted burners of widely different candle power. The pressures employed ranged from 40 to 56 inches (water-gauge).

Gas v. Electricity.

So much has been said on this vexed question that one feels it hardly worth while to touch upon the cost aspect in any than a very brief manner. The "Manchester Courier" for Nov. 21, 1910, gave some interesting figures, however, which I have thought fit to quote. For 600-candle power, over 2500 hours in the year, the lighting bill, with gas-burners giving 20 candles per foot and gas at 2s. 3d. per 1000 feet, comes to £8 8s. 9d. In the case of electricity, with the best metallic filament lamps giving 1 candle per 1½ watts, and current at 3¾d. per unit, the lighting bill for 600 candles would be £35 3s. 1d. These figures take no account at all of burner and mantle or lamp renewals. If the assumption be made that each mantle has to be renewed three times in the year, and that three new gas-burners are needed in the same period, we have £1 0s. 3d. as maintenance cost. Making allowance for two renewals of metallic filament lamps in the year, we get £4 as electricity maintenance cost. The total yearly bills then become: Gas, £9 9s.; electricity, £39 3s. 1d.

There are other points of comparison of the rival illuminants, however, besides cost. The influence of each on the purity of the air of rooms has been investigated; and results prove that gas distinctly scores in this respect, making possible much more efficient ventilation than electricity—provided, of course, that a proper system of ventilation is installed.

It is acknowledged that high-pressure gas-light has better penetrating power than electric flame arc lamps during fog. This is a point I have personally observed. Then we have the question of "glare." Dr. E. W. Marchant, in a paper before the Illuminating Engineering Society on Dec. 9, 1910, on the "Progress of Electric Lighting," said it is becoming increasingly acknowledged that it is necessary to screen the direct image of the filament of the metallic filament lamps owing to the image formed on the retina producing undue stimulus, which is most injurious. Everyone will agree that the nearer our sources of artificial illumination approach to sunlight in the nature of their rays, the better it is for our health and comfort; and there can be little doubt as to the advantage of gas in this respect.

Automatic Devices.

This paper would hardly be complete without brief reference to the importance of systems of automatic lighting and extinguishing. It may be pointed out that the idea is no new one. As far back as 1869, several inventions were patented; but none of them was quite satisfactory, and the matter received practically no attention until comparatively recent years. Now, as we are all aware, there are many of these devices on the market, and, generally speaking, they are making headway; in many instances their use being justified by actual experience.

Discussion.

The President (Mr. R. S. Ramsden, Burton-on-Trent) remarked that they had listened to a very interesting paper, which had been rendered still more entertaining by the exhibition of so many samples and lantern slides.

Mr. W. Batt, jun. (Birmingham), pointed out that Mr. Pickering had given them some interesting particulars with regard to Murdoch's gas plant, but he did not say what was the cost per 1000 cubic feet of the gas made in it, or the candle power. Then as to inverted burners, he noticed in the paper a statement that these were little known before the Earl's Court Gas Exhibition of 1904. He might mention, however, that the inverted burner was first introduced into this country by the New Inverted Company in the autumn of 1901. The small 1-foot burner was introduced about fifteen months later. It seemed to him that the efficiency stated, of about 30 candles per cubic foot of gas for practical work with a low-pressure burner, was rather high. In the paper, two different methods of incandescent light maintenance were referred to. The first was to contract for attention to burners, glassware, and mantles, at an inclusive cost; and the other was to undertake the cleaning and adjustment of the burners for a nominal figure, and to charge mantles and glassware as used. He (the speaker) had had a considerable amount of experience in the matter of maintenance; and he found that the latter arrangement was more satisfactory and economical than making an inclusive charge for cleaning the burners and supplying materials. People were apt to be somewhat careless if the gas undertaking had to provide them with new mantles.

Mr. W. Lycett (Birmingham) expressed the opinion that the lighting branch of their business was the one which more required careful looking after than any other. If gas was to be used for power and manufacturing purposes, some concessions had to be made; and if the use of gas for cookers and fires was to be pushed beyond the normal, something had to be offered here, too. Therefore it seemed to him that the lighting side of the business was the most important to gas undertakings, and so should be carefully looked after. In order to secure lighting consumers, there were many things that had to be considered. For instance, there were some burners sold which proved anything but satisfactory—especially among the cheap ones. They might make a noise or smell, or they might be placed on fittings that were not at all suitable, which would result in loss of mantles. A well-trained fitter could generally put such matters right; but it usually meant that the whole thing had to be taken to pieces and readjusted. If good fittings were always employed, a lot of mantles would be saved. Mantles themselves ought to be tested very frequently, because many were sent out that did not by a very long way come up to the standard.

Mr. W. E. Cadwallader (Birmingham) said the question of incandescent lighting was one to which especially those in the distribution department would have to give as much attention as they could, so as to keep abreast of the times. They should learn all they possibly could about the various systems in use. With reference to the remarks on gas *versus* electricity towards the end of the paper, while the case quoted was quite true, and in some instances there might be an even greater difference in the relative costs, still, at the same time, in other cases they found the comparison was not nearly so favourable for gas. He knew of many cases in which electricity was sold at a lower rate than 3¾d. per unit, and in which gas was charged for at over 2s. 3d. per 1000 cubic feet; and, of course, the greater the difference in this direction, the less favourable did the gas case appear. A case came to his notice a little while ago in which people had taken up electric light after being accustomed to gas; and he inquired particularly as to the cost. They had been having a slot-meter for the gas, and paying 3s. 1d. per 1000 cubic feet. He could not recall the exact price charged per unit for the current; but after using the electric light for eight months, the people stated that the actual cost came out to practically the same for electricity as for gas. Thus they would have to look after their laurels and keep abreast of the times if they wished to increase the number of consumers. One thing he thought they should try and do was to train the gas-fitters to the improved methods of lighting. Some sixteen or seventeen years ago, he well remembered, the Fittings Superintendent of the Gas Department gave a lecture to the gas-fitters on the incandescent mantle and burner, which were then comparatively new; and he thought if they could now have similar lectures to gas-fitters (say) on high-pressure lighting, it would help them very considerably in dealing with cases they were sent to look after. As it was, a fitter might be dispatched to a place, and find there was in use a system of high-pressure lighting the particular pattern of burners employed in connection with which possibly he had never seen; and therefore he would have to get along as best he could, using his previous knowledge of low-pressure lighting, and very often making mistakes and causing a great deal of unpleasantness. He had had cases of this kind brought to his notice; and he thought if they could have lectures for fitters, with practical experiments, so that they could see the different burners in pieces, and learn just what the parts were, there would be fewer complaints from consumers. He quite agreed with what had been said on the subject of cheap burners. When on his way to the meeting, he noticed in a shop window that they were recommending people to walk up quickly and buy their new inverted light, 1s. complete. It seemed to him that a burner, mantle, and globe complete that could be obtained for this sum would hardly be likely to become a credit to the Gas Department. There were many cases in which people had had inverted burners particularly that had given off a most offensive smell, and others in which lighting-back was always taking place. This was due to carelessness or cheap burners; and he thought that they should advocate the use of better-class burners, which would seldom or never light-back, and which would certainly give off no unpleasant smell.

Mr. B. J. Bell (Birmingham) remarked that they were all more or less interested in the applications of incandescent lighting, but none so much as the consumers who actually used it for the illumination of their premises. There was no doubt that one of the greatest drawbacks to the incandescent light was faultily constructed burners. It seemed strange that many inventors and manufacturers should spend the greater part of their time trying to bring out various types of burners simply to get over patents

that were really of no value. Serious trouble was often caused to the suppliers of gas, who had eventually the task of remedying defective lamps. More particularly was this noticeable in respect of large outside lamps. It seemed that the gas and air adjustments, which were, perhaps, the most important part of the lamp, were becoming too mechanical, and were apt after a short while to get gradually out of order. The consumer was hopelessly lost in dealing with the matter; and the lamp had either to be scrapped or pulled to pieces and put right. These parts were generally inaccessible. Instead of aiming so much at mechanical contrivances for air and gas adjustments, the thing should be made more simple. A lamp, instead of being merely made to sell, should be made with the object of giving the best results over a good life. As to maintenance, consumers did not wish to be troubled with an additional charge for keeping their burners, &c., in order; and there was no doubt that ultimately maintenance would have to be looked at in its broadest sense, and the consumers would have to be treated as if they were buying light, and not the commodity which the undertakings had to sell—gas. ["Hear, hear."] They could easily understand the position, if they considered that a bill might not amount to more than 12s. or 15s.; and a charge of a few shillings above this was a trouble to the average consumer. He noticed the author said that very often the life of a mantle was determined by the need for cleaning the burner. He (the speaker) questioned this very much. A trained maintenance fitter ought to be able to take a mantle off and replace it without causing any damage whatever. At the same time, of course, they knew that upright mantles were more difficult to handle than the ordinary type of inverted mantle. In the matter of testing mantles, he doubted very much whether the apparatus alluded to in the paper was actually of very much service, except in a comparative sense. The only real method of testing mantles was by using them in actual working, and so finding out their life and illuminating power. At the same time, no consumer would object to a drop of a small percentage in the illuminating power of a mantle, for the simple reason that he would not notice it. The last ten years had seen wonderful improvements—in fact, almost a revolution—in gas lighting; and the next decade would not be behind the last. But they might depend upon it that their electrical friends also would improve. The fight between the two would be centred, not on power or heating so much as upon the illuminating side of the business. It was here that the gas people had most to lose; and it was here the business would require the greatest attention.

Mr. F. J. Ward (Knowle) agreed with what had been said as to the difficulty in which gas suppliers were placed in having to deal with the cheap burners which were hawked about from house to house. Hawkers often invaded his district; and it was hard to persuade a customer to take a burner which one knew would give satisfaction at (say) 2s., when a hawker was prepared to supply one at 1s. This was a trouble which he was afraid tney would always have to face. He thought the author seemed to run away with the idea that low-pressure lighting had practically no future before it—that it was really played out, and that high pressure was the thing to look forward to. If this was the case, he was sorry for small gas undertakings, because high-pressure lighting they could not touch at all yet. But he was quite confident in his own mind that low-pressure lighting was not played out, and had a future before it. In fact, they saw almost every time they took up their technical journals that some improvement had been made in this system. Take, for instance, some low-pressure lamps which he had at work at Knowle. These might be called upright or inverted, as one liked. The nipple was upright, and the mantle was inverted by means of a swan-neck. With a consumption of 3 cubic feet per hour, he was prepared to maintain that the light was about 80 candles. Probably, with some minor alterations which he proposed to adopt in the future, the efficiency would be much increased. Undoubtedly, high pressure had a great future in front of it, especially where gas undertakings were in direct competition with electricity—which he took it was the case in Birmingham. There both departments, he believed, were striving very hard to outdo each other, though the Committees would probably say it was not so. He was greatly interested to know what had been done with high-pressure lighting; and he would like to hear whether it was possible to maintain the efficiencies which they heard from time to time had been arrived at—such as 70 candles per cubic foot of gas.

Mr. B. W. Smith (Walsall), on the invitation of the President, said he could only add to what other speakers had said his own praise of Mr. Pickering for the admirable way in which he had culled information and prepared his paper. Incandescent lighting was, and should be, a question which was foremost in all their minds; and it was a development which he felt sure would not stand still. They were on the eve, he believed, of a revolution in the incandescent burner—especially the inverted burner; and he was convinced that the electricians would have to look to their laurels, if they wished to maintain such a position as they had secured in regard to inside and outside lighting. In fact, one might see from the lantern slides that had been shown, and from the Technical Press, that the electricians had already lost such headway in the matter of outside lighting as it would be very difficult for them in the future to recover. As to the technical points raised by Mr. Pickering, he had not come to the meeting to enter into the discussion; but having had some considerable experience of inside and outside lighting, he must say that the subject was one which, the more one looked into it, the more intricate did it become.

Mr. R. J. Rogers (Birmingham) pointed out that Mr. Pickering mentioned an efficiency of 20 candles per cubic foot for the inverted burner at the time of the Earl's Court Exhibition. This was only about six years ago; and now they were able to get 60 candles per cubic foot with an inverted burner. This showed how striking an advance had been made in a few years. If they went on at this rate, it looked as if they would approach the figure spoken about several years ago, but laughed at then—namely, 100 candles per foot of gas. He was one of those who believed the limit had not been reached as regarded efficiency in candle power per cubic foot of gas. As to Mr. Ward's remarks on the subject of low and high pressure lighting, he (the speaker) did not think it was Mr. Pickering's intention to suggest that low-pressure lighting was played out. There were many indications that it was not finished with. In London, a lot of lighting was successfully carried out by means of low-pressure cluster burners. High-pressure lamps were, of course, suitable for large thoroughfares, refuges, squares, and so on, where high-power units were required. The author mentioned that in Berlin during December last, about 500 low-pressure inverted lamps, each of 600-candle power, were installed; and if these were satisfactory, let them consider what it would mean. If they could get 600-candle power units without the necessity of laying down high-pressure mains, then the continued success of high-candle power gas lighting would be assured, not only in the centres of cities, but also in the suburbs. The experiment in Berlin would be one of very great interest. On the subject of the mantle-testing machine, he agreed with Mr. Bell that for gas undertakings to be guided entirely by such a method in buying mantles might be fatal. There was only one way, and that was to take the actual performances of mantles used under every-day working conditions. The fitting of high-power gas-lamps with gear and suspending them centrally across the roadway in London had, he believed, been carried out in the nature of an experiment; and from what he could gather it was not altogether in complete favour with the authorities. There were many objections to the central lamps; one of the chief ones being that persons entering vehicles had to do so in shadow, instead of having the light to assist them from the side. The author referred to the question of "glare;" and this was a point which they, as gas suppliers, should not forget when they were speaking of the comparative costs of gas lighting and electric incandescent lighting. There was no doubt that clear electric lamps should be screened. Medical evidence had shown that there was a very serious effect on the retina caused by receiving the rays of these lamps directly on the eye; and his point was that if electric lamps had to be screened, it meant that there would be required two, three, or probably four times as much light so as to secure the same lighting effect. They should be ready to press this home as a point in favour of gas.

Mr. W. Gibbs (Birmingham) also agreed that low-pressure gas lighting was not by a long way played out. Given 2½ to 3 inches of pressure, excellent results could be attained with it. Where there were low-pressure mains, people who desired to have high pressure could do so by installing their own compressors. When such an installation had been fitted up, it was necessary that mantle maintenance should have careful attention. It was the light that such people wanted. They did not mind a little extra cost, if they could have the light. With high-pressure gas, they need have no fear in competing with the electricians, more particularly for exterior lighting. He felt confident that gas would make still further strides, if only makers could construct a smaller design of lamp than the present ones, which were objected to in front of shops. Cheap burners were a great source of trouble with gas authorities; and they were frequently to be seen working under villainous conditions. No doubt, further progress would be made with low-pressure lamps. At present, it was difficult for any but an experienced man to take a lamp to pieces after being in use for a time; and the more "fool-proof" the lamps could be made, the better it would be.

The President inquired whether Mr. Pickering had had any experience with the soft or non-collodionized mantles; and, if so, how he found them compare with the ordinary form.

Mr. Pickering, in replying to the discussion, said he was much obliged to the members for the kind way in which they had received his paper. With regard to what Mr. Batt had asked, he regretted that he could not give the cost per 1000 cubic feet of the gas made in Murdoch's plant. It was interesting to note that the date of the introduction of the inverted burner was three years before the Earl's Court Exhibition. So much the better for the gas industry. On the question of efficiency, he mentioned in the paper that the nearly 30 candles per cubic foot of gas with a low-pressure burner was taken from actual tests. Some tests made on the works with the "Visso" burner gave, at 27-10ths pressure, 29·1 candles per cubic foot of gas as the actual efficiency. He would not say there was no other burner which would furnish the same result; but he himself had never before tested a burner that gave nearly 30 candles per foot at this low pressure. He merely included in his paper the references to maintenance for the purpose of securing opinions on the subject from members who had had more experience of this particular aspect of the question than he himself had. Certainly, it was an important point for them. With regard to training fitters, he was sure this was a very important matter. Such lectures as had been suggested would no doubt induce them to take a greater interest in their work; and this must tend to greatly benefit the industry. Thus money spent in such a direction should be amply repaid. Another important question had been touched upon by members, in the shape of faulty burners,

Besides the bearing this matter had upon economy, it must be remembered that if people saw street-lamps working not under the best conditions, they were apt perhaps to be prejudiced against gas because of it. The proper maintenance of both public and private burners was well worth careful attention; and in this connection, a remark came to his mind which had been made by someone who had seen the gas lighting in Berlin. This remark was to the effect that in Berlin it was quite an unusual thing to see a mantle not in good condition; and that practically all the street-lamps were thoroughly looked after and properly maintained, so that no objection on this score could be made against the gas lighting. Certainly, an efficient fitter should be able to remove mantles from burners without breaking them; but when, as in the case of some churches, mantles were left on without attention for eighteen months (and, he had been told, two years in some instances), it would not be increasing the cost so very much if a fitter did have to put on a new mantle. Next as to the testing of mantles. He merely brought the shocking-machine down so that those members who had not seen it working might have an opportunity of doing so. Personally, he did not lay very much stress on the actual working of the machine, because he agreed with the remarks made, that it was not an absolute criterion of the properties of any particular make of mantle to get one that would give a good result in the shocking-machine. They could only get a real test of a certain make by applying it to maintenance work for some months, and noting how the results for the particular mantle came out. He could give them some figures as to the number of shocks mantles of the two types were expected to be able to stand on the machine. A good average figure he was told was 3000 shocks for inverted, and 1200 shocks for upright mantles, before breaking. He had not, however, made any actual tests for himself; so that he could only quote the figures given to him. He quite endorsed what Mr. Rogers had said on the question of low-pressure lighting, and could assure Mr. Ward that he did not think this system was played out at all. He was rather interested, when he came across the reference to lighting in Berlin with high-power low-pressure units, to see that in a city where high-pressure lighting obtained so much they had been induced to try these low-pressure lamps for street lighting. Certainly, for the suburbs, where one would have to go to great expense in laying a high-pressure main, it would be a good thing to make use of low-pressure high-power burners. He, too, regarded hopefully the future of incandescent gas lighting, and looked forward to the time when they would get a still higher duty from their gas. Of course, theoretically they all knew they were nowhere near the full efficiency of the gas as regarded lighting; and no doubt great strides would be made in the future in burners, probably of the inverted type. As to high-pressure lamps fitted with gear for lowering, it was a convenient plan where they were centrally suspended; but he should think this would be advisable only in very wide roadways, which required lighting in the centre and also at the sides. If central lighting alone were adopted, there would be so much shade thrown by vehicles standing at the curb that buildings at the side of the road, and the footpath, would not be lighted as well as should be the case. He thought that footway lamps suspended from columns would in such a case be the best method to adopt. In answer to the President, he had not had any actual experience in the use of soft mantles as compared with ordinary ones on maintenance work; but the Gaslight and Coke Company were using them almost entirely for their own purposes, and when a big concern took up a thing like this, and stuck to it, it must be fairly good. People had assured him that the soft mantle had a great future before it.

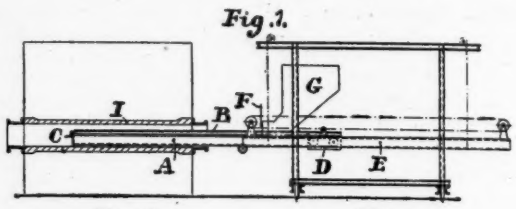
EITLE'S RETORT-STOKING MACHINERY.

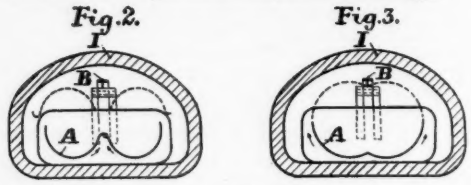
Two patents have lately been taken out for France by Herr Christian Eitle, for machinery for charging and drawing horizontal retorts. The chief features of the appliances will be apparent from the following particulars and the accompanying diagrams.

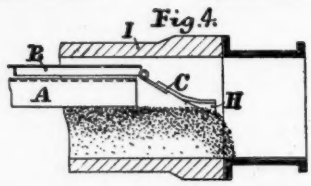
Taking the earlier patent first, a longitudinal section of the arrangement is shown in fig. 1; figs. 2 and 3 are transverse sections of a retort, showing two different methods of operation; and fig. 4 is a longitudinal section of part of the appliance.

The scoop A, which is in two parts, is turned by means of two rotary shafts in the body of the apparatus D, which, being furnished with rollers, can move on the frame E. Above the scoop, and fixed to the body, there is an iron projector B, to which the push-plate C is secured by a hinge. This plate, when in its ordinary position—*i.e.*, lowered—rests against the edges of the halves of the scoop. A bin G, mounted on the framework, serves for filling the scoop during its introduction into the retort I; the coal being delivered through an opening provided with a sliding door. In order to obtain a uniform layer of coal over the entire length of the retort, and to make it possible to alter the thickness of the layer, there is in front of the discharge channel a partition F, the height of which can be regulated, while the lower portion is arched, to correspond with the shape of the charge. By means of this partition, the coal can be evenly distributed over the scoop, and the quantity regulated by altering the position of the partition.

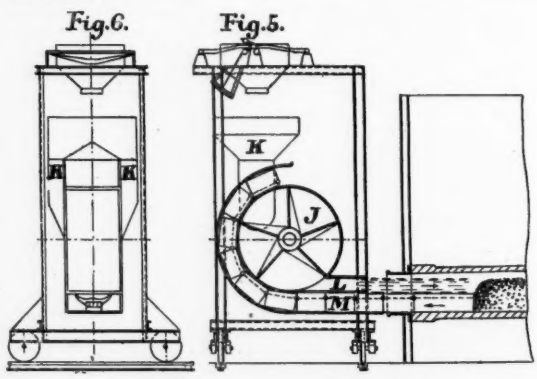
The action of the appliance is as follows: When the scoop has been brought in front of the retort to be charged, it is introduced, and the push-plate then ejects the mass of coke at the other end. During this operation, the plate rests upon the extremity of the

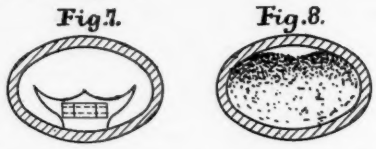






two portions of the scoop, so that the projector B (the sole use of which is to carry the plate) is not subject to any strain. When the scoop has been pushed into the retort, the two halves are turned so as to discharge the coal. The scoop then takes the position indicated by the dotted lines in figs. 2 and 3, one of which shows a scoop turning inwards, and the other one turning outwards. When the two halves of the scoop are drawn back, they slide over the charge of coal, as does also the push-plate, owing to its hinge. A projection H, resembling a ploughshare, can be adapted to this plate, so as to spread the coal towards the outside when the scoop is withdrawn.





Coming to the second patent, the object of the invention is to enable the charging and drawing operations to be performed with heavier charges than have hitherto been possible. The patentee's arrangement is shown in the diagrams; fig. 5 being a longitudinal section, fig. 6 a front view, fig. 7 a section of a retort showing the discharger, and fig. 8 a view of a charged retort.

The projector J, which is furnished with blades, is combined with the channels of the feeder K, an outlet L, and a discharger M. The last-mentioned appliance forms, as shown in fig. 5, a prolongation of L. On the upper side of the discharger are two channels of the shape shown in fig. 7. The coal is sent into the feeder from a bin above it. The machine having been brought to the front of the retort to be dealt with, the discharger is driven forward so as to push out the coke at the opposite end. Then the charger is set in motion, and the retort can be filled in the usual way. The discharger is drawn out gradually as the charging operation proceeds, and the coal is deposited in two parallel layers; thereby ensuring good distribution of the material, as well as perfect utilization of the heating surface of the retort. It will be seen from fig. 8 that a kind of furrow is formed on the upper surface of the charge of coal along its entire length. This is particularly useful with full charges, as a passage is made for the escaping gas.

The patentee says it is preferable, with heavy charges, to have conical retorts, increasing in size towards the discharging end (as in the case of vertical retorts), as this facilitates drawing. The appliance can be raised or lowered, so as to deal with all the retorts in a setting; and, being mounted on wheels, it can be moved along the front of a bench.

MECHANICAL TRANSPORT OF MATERIALS IN GAS-WORKS.

By R. E. Gibson, Assoc.M.Inst.C.E., of Liverpool.

[Extracts from a Paper read before the Liverpool Engineering Society.]

The mechanical transport of loose and friable materials, such as those dealt with on gas-works, has for many years exercised the inventive faculties of engineers. The subject is one of vital importance, from an economic and financial standpoint, to many of the great industries of the world. Its importance is especially manifest in regard to the handling of coal, the great natural source of heat and power. In collieries, electric stations, gas-works, and other industrial establishments where coal is used in large quantities, engineers have been called upon to devise mechanical means for transporting the fuel to the place of use, in order that the cost might be reduced to the lowest possible point.

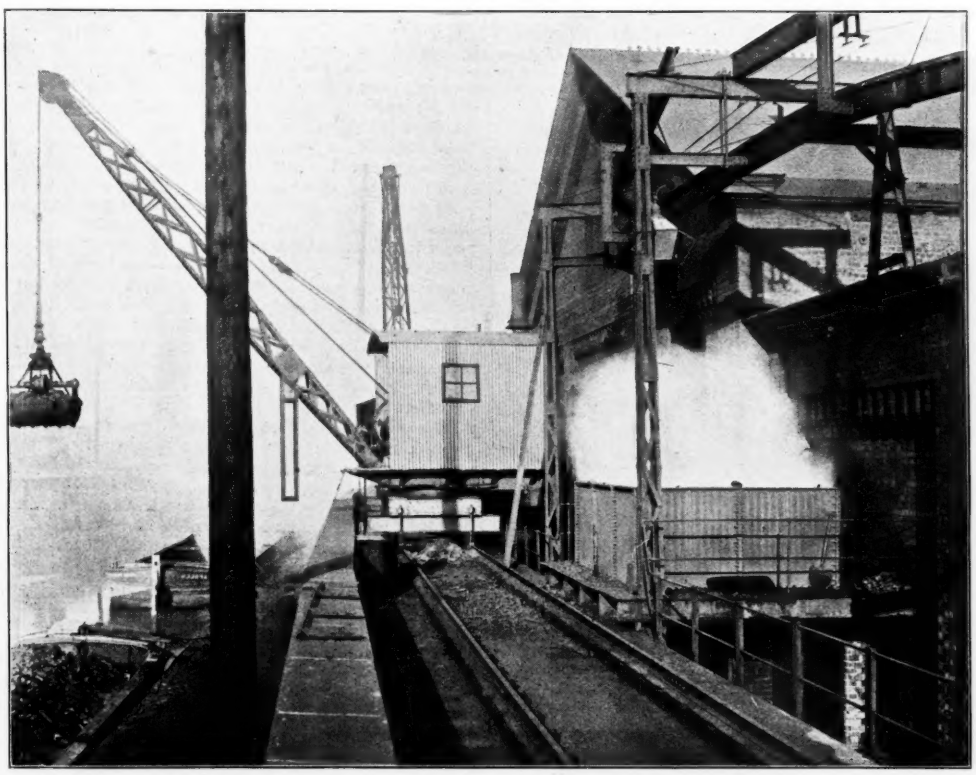
Many causes have, no doubt, contributed to bring this about, such as competition, labour difficulties, desire for efficiency, and regularity in working; but financial considerations have ever been paramount in this, as in most branches of engineering. The important place that mechanical transport occupies in gas-works economics may be realized when it is noted that at the Liverpool works alone some 268,000 tons of coal and 174,000 tons of coke, besides large quantities of other materials, are dealt with every year. A net saving of 1s. per ton in handling this quantity means a reduction of some £24,000 per annum in working expenses, or about 1½d. reduction per 1000 cubic feet in the price of gas. Apart from monetary considerations, there are many collateral advantages. Labour troubles are minimized; a better class of labour is employed, requiring more skill and intelligence; and last, but not least, the work is done in a better manner, with more uniformity and regularity.

The author is aware that the subject of mechanical transport is a vast one, and cannot be comprehensively dealt with in the limits of this paper; so it is proposed to deal mainly with some types of elevating and conveying machinery which have been under his observation at the works of the Liverpool United Gaslight Company, and on the design and construction of which he has been engaged, under the direction of the Company's Engineer-in-Chief, Mr. Edward Allen, M.Inst.C.E., the President of the Society.

[In order that the work done by the different conveyors might be rightly understood and fully appreciated, the author had prepared a plan of the Linacre Gas-Works, indicating the various stages of the journey taken by the coal from canal barge to retort, and by the coke from the retort to its exit from the works.]

General System of Transporting.

The various operations are as follows: (1) The coal is brought alongside the works by canal or rail; (2) it is elevated from the boat to the receiving hopper; (3) weighed automatically and broken small in a breaker; (4) elevated to the top of the retort-house; (5) conveyed to the overhead coal-bunkers; (6) run by gravity into the measuring chamber of the charging machine, and placed in the retort by it; (7) pushed out of the retort as coke; (8) the coke is quenched and transported to the receiving hopper or stock heap, and (9) screened and conveyed to the coke-bunkers. Some of the coke is (10) broken in a coke-cutting machine, and screened to various sizes, and (11) taken away by cart, rail, or canal. The clinker is (12) hoisted from the cellar, and conveyed to the stock heap. The purifying materials are (13) conveyed from the purifiers to the revivifying floor, and *vice versâ*. It is worthy of note that, by the system outlined above, the coal is not touched by hand labour from the time it is dispatched from the colliery to its departure from the gas-works as coke; fourteen different operations or machines being pressed into the service to enable the material to accomplish the journey expeditiously and economically.



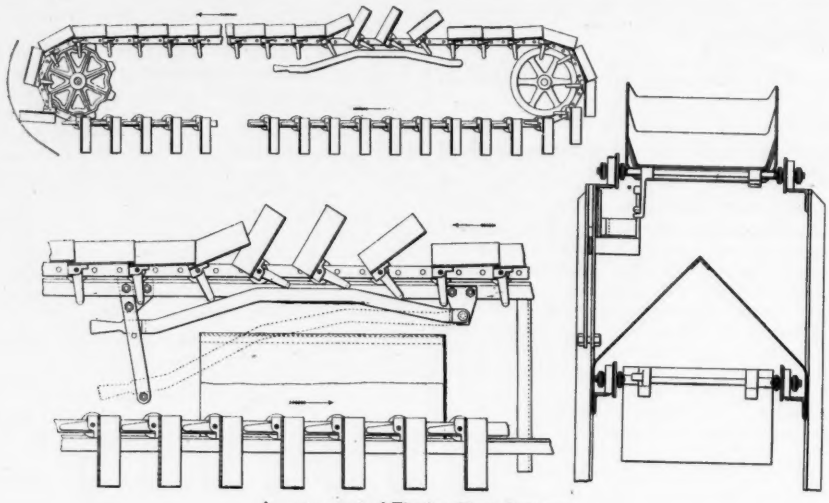
The Jib Crane and Grab for Unloading Barges, also the Telpher Track and Coke-Quenching Tank, at Linacre.

Conditions Affecting Design.

In determining the design or type of machinery to be adopted, the physical condition of the materials is an important and ruling factor. Questions as to whether the materials are large or small, hard or soft, wet or dry, hot or cold, gritty or smooth, heavy or light, influence very largely the type of plant used. Special conditions call for special methods of dealing with them; and it very often happens that the machinery which is suitable for one works may be quite unsuitable for another of the same kind, owing to different conditions prevailing. When received for gas-making purposes, coal may be in very large lumps or in varying sizes, ranging down to nuts, peas, or slack. Some undertakings use the small exclusively, and very often the plant for dealing with it is only capable of handling coals of this class. The major portion of the Liverpool gas coal is delivered by canal. It is screened before delivery, and contains a considerable quantity of large lumps. Some method, therefore, had to be found which would be applicable to any size of coal.

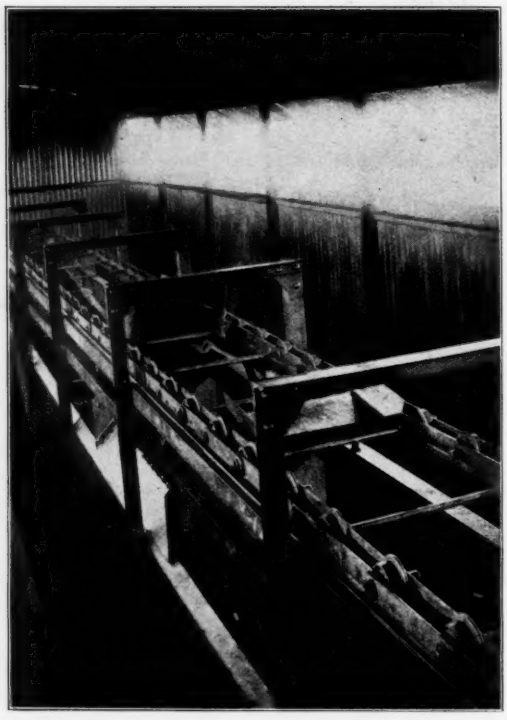
Unloading.

In the year 1904, a fixed revolving steam jib crane and grab were erected alongside the canal, at the Eccles Street works, for discharging the barges and delivering the coal at a high level to the weighing and breaking machinery, on its way to the retort-house, or to the stock heap, as occasion required. The grab was of the double-chain type, having a maximum capacity of 12 cwt.; and the crane was capable of discharging 20 tons per hour. This method of unloading was found to fulfil the conditions so well, and resulted in so great a saving in wages, that similar cranes were installed at each of the canal stations, except that the grabs were of the Priestman single-chain type, and of 15 cwt. capacity. Two of the cranes were made to travel on an elevated craneway, instead of revolving at a fixed point; thus increasing their range of usefulness. The single-chain grabs appear to be quite as efficient as those of the double-chain type, and require a simpler



Arrangement of Tipping Tray Conveyor.

form of crane. At other works, where coal is delivered in railway waggons or carts, their contents are tipped into a receiving hopper at the ground level. A hydraulic ram is sometimes employed for discharging end-door waggons. Where the site permits, advantage is often taken of a high-level railway to discharge by gravity through bottom doors. The latter plan was adopted in the case of the Midland branch siding at the Linacre works.



The Tipping Tray Conveyor for Coke during erection at Linacre.

Weighing and Breaking.

Where coal is delivered by cart or waggon, the old-fashioned method of weighing on an ordinary weighbridge is in vogue; and probably it cannot be improved upon. For canal-borne coal, however, other means have to be adopted. Taking the draught of the boat is useful as a check; but this is not in itself a sufficiently reliable indication of the weight on which payments are to be made. At the canal stations of the Liverpool Gas Company, the coal is weighed by means of Avery machines, which automatically register and totalize the weights, and discharge the material through bottom doors. These machines are not affected by the large size of the coals, and are accurate to within 0·5 per cent.—satisfying all the requirements of the Board of Trade.

Coal of large size needs to be broken small before it can be placed in the retort, so that the charge may be even, and the resultant coke homogeneous. In many works, where fine coal is exclusively used, there is no need for a breaker. This, however, is rather the exception than the rule. Wherever machinery is employed to convey coal and to charge retorts, it is very desirable, if not absolutely necessary, that the coal should be small, and of fairly uniform size throughout. The finished size of the coal must, when broken, be suitable for the means employed for charging the retort. If hard cannel is used at all largely, as in Liverpool, specially strong breaking machinery has to be installed; and the breakers have been designed to reduce large lumps of the hardest cannel to pieces small enough to pass through a 1½-inch diameter ring.

Elevating.

After the coal has been broken to a suitable size, it is elevated to the upper part of the retort-house, and conveyed to overhead bunkers, ready to be charged into the retorts. The elevators used for this purpose at the Liverpool works are, without exception, of the bucket and endless chain belt type. As will be seen from Table I. their mechanical efficiency compares favourably with those of other types. Practical experience over many years has shown them to be reliable, cheap in first cost and in working, requiring little attention, and being easily maintained. At the Linacre works, a pair of elevators have been at work for thirteen years, and during this time have raised 400,000 tons of coal to a height of about 45 feet, giving very little trouble since their erection. One of the best chain belts is "Ley's bushed," which has been found to last a long time, and is easily and quickly repaired or replaced—being fitted with renewable bushes. The most serviceable runners are probably chilled malleable iron reversible runners. The wearing strips on which the runners slide are of mild steel, and the fine coal dust, which is ever present within the case of the elevator, acts as a lubricant.

For hard material, it is almost essential that the elevator should have a free and open feed; the buckets scooping up the coal from the floor as they rotate around the lower shaft. In this way, any jamming is impossible. An additional advantage is the greater accessibility. All such elevators should be provided with adjustable bearings at the lower end, and adjusting screws of ample length to take up the stretch of the chain. The speed of the chain belt is a matter for careful consideration, affecting, as it does, the capacity of the elevator, the power required to drive it, the wear and tear, and the amount of unprofitable work done. The speed which appears to give the best results for coal, having regard to these points, is 90 to 120 lineal feet per minute. This speed is such that the momentum of the moving parts is comparatively small, the wear and tear is not excessive, and to keep the elevator fully employed is not an impossibility. Easy access to all parts of an elevator is very desirable. In this respect, the open or lattice framing is preferable to sheeted framing; but the latter affords protection from the weather, when the elevator stands outside a building.

The inclination of the elevator to the horizontal may be anything from 45° to 90°; but whatever the angle may be, the buckets should be so designed that the maximum capacity, having regard to the angle of repose of the material, may be obtained. It must be borne in mind that the nearer the angle of 90° is approached, the less is the friction on the runners. On the other hand, the delivery is not so good, as there is a tendency for some of the coal to fall down the case of the elevator; the centrifugal force very often being insufficient to project all the coal into the shoot. The average angle adopted at the Liverpool works is 65°.

Another very useful form of elevator, which also acts as a conveyor, often used for coal, is the gravity-bucket conveyor, introduced to this country by the C. W. Hunt Company, of New York.

Conveying.

The coal raised by the elevator is conveyed to bunkers ready for use in the retort-house. Many different forms of machinery have been brought out for this purpose, but perhaps the form most commonly used on gas-works is the trough and push-plate conveyor. [The author described this appliance by the aid of a diagram.] This type of conveyor is specially suitable for feeding a long line of hoppers, as it will deliver the coal through openings in the bottom of the trough anywhere in its length, the openings being controlled by sliding doors. It requires little attention, and seldom gets out of order. Its mechanical efficiency is very

low indeed; but the attendance and maintenance charges are almost negligible. The longest conveyor of this kind at the Liverpool Gas-Works is 193 feet in length from centre to centre of the wheels. This conveyor has been in constant operation the last four years, and has cost next to nothing for repairs.

A new type of conveyor was put to work at Linacre in October, 1909, for filling a line of continuous coal-bunkers. The coal, instead of being pushed along, as in the case of the push-plate conveyor, is carried on a continuous tray, composed of a series of hinged steel plates turned up at the two sides and overlapping at the ends. The plates are carried by wheels and axles, attached to two endless chain-belts, passing over two sprocket wheels at either end of the conveyor. On each of the plates is fixed a projecting arm, which, on engaging a cam, tilts the plate, and empties its contents below. A tray conveyor of the ordinary kind is only suitable for end delivery; but by hinging the plate sections, and providing means for tipping them up, it is possible for the conveyor to discharge at any point in its length—an essential condition for this class of work. The cam is moved in and out of action by a lever, and is fixed to a travelling carriage, which can be pushed to any position in the length of the conveyor. The carriage is also provided with inclined shoots, to deflect the coal clear of the return chain underneath.

In this machine are combined some of the advantages of the well-known gravity-bucket conveyor and the good points of the push-plate conveyor—viz.: (1) Greater mechanical efficiency, and hence less power to drive; (2) it can be used on a steep incline; (3) it requires no special apparatus for feeding; (4) it can discharge at any point in its length. In regard to wear and tear, sufficient time has not yet elapsed for definite information to be gathered; but it is probable that no unusual expenditure under this head need be anticipated. The angle at which the tipping-tray conveyor may be inclined is only limited by the angle of repose of the material dealt with; and it can be further increased by forming transverse lips on the trays projecting upwards. This feature is a valuable one, as thereby the conveyor may also be used to raise the material to a higher level, without unduly increasing the amount of power to drive it.

Other types of conveying machinery in use for transporting coal on gas-works are the belt conveyor, the gravity-bucket conveyor, the shaking conveyor, and the tip-waggon and light railway. The belt conveyor is cheap in first cost and very serviceable, if the material is to be delivered at the end only of the conveyor. If, however, delivery is required at another point, a cumbersome throw-off gear, taking up a considerable amount of head room, is needed. At the Athol Street works may be seen an example of the tip-waggon and light railway used continuously for the transporting of large quantities of coal over a short distance of 66 feet. The tip-waggon, which receives one grab full of coal (15 cwt.) at a time, is easily pushed along by one man, and after discharging is returned empty. This means of transport has been included in Tables I. and II., in order that comparison may be made with the more elaborate transporting machinery in point of efficiency and working cost. The efficiency of the tip-waggon is naturally much higher than that of any of the other systems, owing to the very small amount of friction to be overcome. For the purpose of comparison, in Table I. the tractive force required to move the tip-waggon has been taken as 8 lbs. per ton.

Charging and Discharging Retorts.

The coal, after being deposited in the overhead bunkers, is ready to be placed in the retorts, which may be horizontal, inclined, or vertical. In the case of the two latter, the coal is run into, and the coke out of, the retorts by gravity; but where the retorts are horizontal, some form of machine is usually employed for charging and discharging them. Many different kinds of machines have been devised for this purpose—some rope-driven, and others worked by pneumatic, hydraulic, or electric power. One of the most up-to-date machines is the Fiddes-Aldridge simultaneous discharging-charger, five of which are now in use at Liverpool, and deal with about half the total coal carbonized. The special features of this machine are (1) that it discharges the coke from, and places the coal in, the retort at one and the same operation; and (2) that it is automatically fed with a measured quantity of coal from the overhead bunkers as it travels from one retort to the next, and on reaching a retort is immediately ready to charge and discharge it. [The author described the construction and operation of the machine.] The operation of charging and withdrawing takes only about 40 seconds. The machine is driven by a 13½-B.H.P. series-wound motor, and is fitted with travelling and

Table I.

	Reference Letter	Description.	Horizontal Distance Transported in Feet. Max.	Min.	Aver.	Height Lifted in Feet.	Speed in Feet per Minute.	Weight of Material Transported per Hour. Max.	Aver.	Ratio of Weight of Skip or Moving Parts to Max. Load.	Useful Work Done H.P.	Actual B H P. Used. Full Load.	Empty.	Aver.	Efficiency per Cent.
Elevators	A	Crane and grab	..	..	39	19	130	30	15	1·75/1	0·653	..	..	12·2	5·35
Elevators	B	12-inch bucket elevator	..	..	19	42	118	35	10·28	5·43/1	1·665	4·265	2·375	2·93	39·03
Elevators	C	18-inch ditto	..	..	22	36	92	43	18	..	1·755	6·5	3·0	5·0	27·00
Elevators	D	Hydraulic waggon hoist	..	..	..	23	18	70	70	1/1	1·821	..	..	8·68*	20·98
Combined Elevators and Conveyors	E	Gravity-bucket conveyor	179	17	98	30	32	26	24	2·65/1	0·918	2 625	1·375	2 5	34·96
Combined Elevators and Conveyors	F	Temperley transporter	282	153	250	21	520	11	4	2·9/1	0·286	..	4·16†	4·54†	6·30
Combined Elevators and Conveyors	G	Telpher transporter	636	105	462	23	450	15	5·4	4·5/1	0·469	..	4·5‡	5·22‡	8·94
Conveyors	H	18-inch push-plate conveyor	188	20	104	..	125	50	18	4·1/1	0·065	7·5	2·25	4·4	0·87
Conveyors	J	24-inch ditto	129	0	65	..	87	54	30	4/1	0·056	6·6	1·87	4·5	0·85
Conveyors	K	Tipping-tray conveyor	158	9	84	..	44	54	30	2·7/1	0·069	4·5	2·125	3·5	1·53
Conveyors	L	Vibrating conveyor	22	5	12	..	22	45	5·4	..	0·008	..	4·5	5·75	0·14
Conveyors	M	Tip-waggon and railway	67	65	66	..	200	30	16·4	0·7/1	0·0162	·019	..	..	85·26

* Equivalent continuous B.H.P. † Equivalent continuous B.H.P. 30 cycles per hour. ‡ Equivalent continuous B.H.P. 20 cycles per hour.

Table II.

	Reference Letter.	Description.	Period of Working. Yrs.	Mths	Weight Handled per Annum.	Capital Cost.	Annual Charges. Interest on Capital, 4 per Ct.	Maintenance and Renewals.	Attendance.	Power.	Total.	Cost per Ton Handled.	Useful Work Done per Annum (3500 hours) in Hundreds of Foot-Tons.	Cost per 100 Foot-Tons at 3500 Hours per Annum.
					Tons.	£	£	£	£	£	£	Pence.		Pence.
Elevators	A	Jib crane and grab	6	0	35,000	700	28	55	261	73	417	2·86*	20,242	5·61
Elevators	B	12-inch bucket elevator	5	3	38,700	500	12	22	..	50	84	0·52	51,616	0 56
Elevators	C	18-inch ditto	4	2	32,000	350	14	24	..	60	98	0·74	54,416	0·64
Elevators	D	Hydraulic waggon hoist†	16	0	8,000	1600	64	36	33	26	159	4·77	56,350	5·73
Combined Elevators and Conveyors	E	Gravity-bucket conveyor	5	1	3,200	520	21	20	4	1	46	3·39‡	23,829	2·02
Combined Elevators and Conveyors	F	Temperley transporter§	2	9	30,000	1500	60	111	256	57	484	3·87	8,861	8·76
Combined Elevators and Conveyors	G	Telpher ditto§	1	3	38,000	2400	96	164	274	53	587	3·71	14,460	7·67
Conveyors	H	18-inch push-plate conveyor	4	2	32,000	400	16	30	85	46	177	1·33	2,350	29·28
Conveyors	J	24-inch ditto	2	0	72,000	540	22	36	42	56	156	0·52	1,742	30·48
Conveyors	K	Tipping-tray conveyor	1	2	34,500	560	22	38	42	25	127	0·89	2,133	22·27
Conveyors	L	Vibrating conveyor‖	1	0	30,000	300	12	100	256	27	395	3·15	248	317·00
Conveyors	M	Tip-waggon and railway	1	9	25,000	50	2	5	170	..	177	1·70	503	86·87

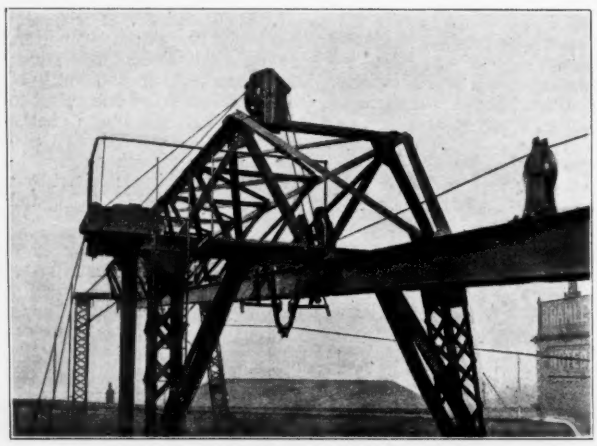
* Would be 1·35d. if worked at full load. † Hoist for coke. ‡ Would be only 0·47d. if worked ten hours per day. § For hot coke. ‖ For screening coke.

lifting gear to adjust the conveyor horizontally and vertically, to suit the different positions of the retorts.

The Handling of Coke.

The coke, after leaving horizontal or inclined retorts, is at a temperature of about 1900° Fahr. As this heat is very destructive to any form of conveyor, it is necessary to quench, or at all events to partially quench, at the earliest opportunity the portion of the coke which is not used for the retort-bench producers. In the case of some vertical retorts, the temperature of the coke on withdrawal is much lower. The handling of hot coke involves conditions entirely different from those presented in the handling of broken coal: (1) High temperature; (2) gritty nature of material; (3) in large lumps; (4) the presence of quenching water or steam; (5) the breaking of the coke to be avoided as far as possible. It is obvious that, under these conditions, the wear and tear must be very great as compared with that of the transport of coal, however carefully the machine may be designed to meet them.

There are three systems chiefly used for dealing with hot coke: The coke is allowed to fall into a steel barrow, tip-waggon, or other receptacle on wheels, in which it is wheeled out by hand labour or rope haulage. The coke is quenched by throwing on water while it is in the barrow or other receptacle, or after it has been tipped in the yard. The hot coke is allowed to fall on to an endless conveyor, which drags it through a water bath or under sprinklers to quench it, and usually carries it up an incline at the end, so that the discharge may be at a suitable height above the yard level.



The Transporter at the Wavertree Gas-Works—Showing the Rope Gear.

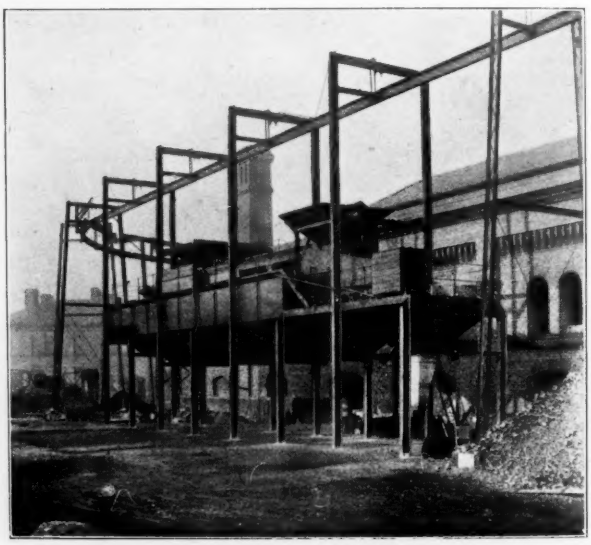
The coke is dropped into a skip, and conveyed to coke-screens, bunkers, or the stock heap by some form of overhead transporter. In this case, the quenching may be done by hose pipes or sprinkler, or by dipping the skip into a water-tank. At Liverpool, the first and third systems are in operation. The second has not so far commended itself, owing to the wear and tear, which must of necessity be heavy, and also the excessive breakage of the coke. The first system is simple and effective, but very costly in labour. The ideal one would be the third, if an entirely satisfactory means of quenching, applicable to this method of transport, were forthcoming; and experiments are now being made with a view to overcoming the difficulties which have presented themselves in the matter of quenching.

Two different types of overhead transporter have been installed at the Liverpool works: At Wavertree, the well-known Temperley transporter; and at Linacre, Strachan and Henshaw's single-rail telpher—both being electrically driven. It will be seen from Tables I. and II. that the efficiency of the transporter works out at 6·3 per cent.; but the working costs are comparatively high. The telpher transporter used at Linacre consists of an endless track, 783 feet long, supported at a height of 34 feet above the ground by a number of steel lattice stanchions and joists; and within the retort-house by horizontal steel joists resting at one end on the wall of the retort-house and at the other on extensions of the retort-bench buckstays. The track itself consists of a steel rail bolted to the top of a continuous rolled steel joist. The speed of travel is 450 feet per minute, and the speed of lifting is 52 feet per minute. On its way from the retort-house to the coke-hoppers the skip, full of red-hot coke, is dipped into a water-tank for about thirty seconds and quenched, before it is discharged. The cycle of operations from the retort-bench and back again takes from 2½ to 4 minutes. [The author described the two systems.] In both these systems of overhead transport it may be claimed that there is a minimum of breakage, and the wear and tear is less than that of the ordinary hot-coke conveyor, as the only part subject to heat, grit, and water is the skip, which may be easily repaired or replaced.

In order to meet a demand for coke broken and screened to certain sizes, a coke-breaking machine and screening conveyors were recently installed at the Linacre works. The latter are of interest, as an example of the reciprocating or vibrating type of conveyor, perhaps more often used elsewhere for conveying coal and other materials. Two sections of trough, the one overlapping the other, are mounted on ball-bearings, inclined at an angle of about 27°. Each section is connected with a crank-shaft having a throw of half-an-inch and a speed of 300 revolutions per minute, by means of connecting-rods and eccentrics. The eccentrics are so arranged opposite to each other that the throw of one screen is exactly counteracted by the throw of the other—thus reducing the vibration on the framework to a very small amount. The inclined bearings give the screen a downward movement on the forward stroke and an upward movement on the return stroke. Strong springs hold the screens down on the bearings. These movements are in the nature of small shocks in rapid succession, which have the effect of propelling the material along the trough at a rate of about 22 feet per minute. By fixing perforated plates in the trough, a very efficient means of screening the material is obtained. The bearings and eccentrics are provided with dust-proof casings; and the advantages claimed are absence of friction, small power necessary, unlimited length, small wear and tear, and vibration reduced to a minimum.

Transport of Purifying Materials.

Transporting machinery may be profitably employed in emptying and refilling the purifying-boxes on gas-works. For this purpose the gravity-bucket conveyor has been installed at two of the Liverpool works, and has proved to be a most serviceable machine. This type may be used not only as a conveyor, but also as an elevator, and the different portions of the one installation are sometimes used for entirely different purposes. These points are greatly in its favour, and make it specially useful in some situations. At Eccles Street, for instance, the purifying-house is a three-storey building. The lower strand of the conveyor is fixed to run along the ground floor, and the upper strand along the second floor—the first floor being occupied by the purifiers. By means of the upper length of conveyor, the oxide of iron on the second floor may be carried along and automatically tipped into the shoots leading to the purifiers, while the lower part of the conveyor may be used at the same time for conveying and elevating oxide from the ground floor to the purifiers—thus saving a great deal of time as well as labour.



Telpher Track and Coke Plant at Linacre.

Other advantages of the gravity-bucket conveyor are the comparatively small amount of power required to drive it, the ease with which it can be adapted to many awkward positions, the small amount of room required for the vertical portion, and its ability to take its feed at any point and to discharge at any point. There is one disadvantage, however, which may be generally stated against this conveyor, and it is that if one part breaks down the whole of the installation is at a standstill. This does not obtain where each portion of an installation is a separate machine. The positions taken by the gravity bucket conveyor in Tables I. and II. speak for themselves, and need no further comment.

Efficiencies.

Table I. gives the relative mechanical efficiencies of twelve different kinds of transporters, selected as typical examples, out of a list of forty machines. The tables give the horizontal distance in feet to which the material is transported, the height in feet to which it is raised, the speed of travel in feet per minute, the maximum and average working loads per hour, the ratio of the weight of the moving parts to the maximum load, the useful work done expressed in horse power, the actual brake horse power used, and the relative efficiencies per cent. The actual brake horse power has been obtained from ammeter readings; in most cases, a loss of 20 per cent. in motor efficiency being allowed for in converting ammeter readings into brake horse power.

The efficiencies in the last column of the table have been obtained by dividing the useful horse power by the actual brake horse power, and multiplying by 100. The figures under this heading are very striking, and show that a large proportion of the actual power applied is used in overcoming friction, due to the weight of the moving parts. This is especially apparent in the case of the machines for horizontal transport. The efficiencies of the push-plate conveyors are naturally very low, owing to the great weight of the moving parts and the large amount of friction which must take place between the material and the bottom of the trough. The great difference between the actual brake horse power at full load and when empty clearly shows this. In example H, for instance, the brake horse power at full load is made up as follows:—

Useful work done	0·06
Work in driving machine empty	2·25
Work in overcoming friction of coal, &c.	5·19
Total	7·50

The gravity-bucket conveyor (E) is very high in point of efficiency—being 41·01; and this figure would be higher still if the conveyor were used mainly as an elevator, as the horizontal portion absorbs a great amount of power in overcoming friction. The tipping-tray conveyor (K) is much more efficient than the push-plate conveyors; being 1·53, as compared with 0·85 and 0·87 for the latter.

The brake horse power at full load in this case may be analyzed as follows:—

Useful work done	0·069
Work in driving machine empty	2·125
Work in overcoming friction, due to extra load	2·306
Maximum brake horse power	4·500

It will be observed that the extra power required to convey the load is 2·306, as compared with 5·19 in example H, or less than half of that required for the push-plate conveyor.

In examples A, D, F, G, the efficiencies are reduced, owing to the grab, waggon, or skip being, for certain reasons, unusually heavy; their weights being from one to four-and-a-half times the weight of the load. It must also be borne in mind that the work is intermittent; time being lost in grabbing, loading, quenching, discharging, and other operations. In regard to the bucket elevators B and C, it will be seen that the actual brake horse power is from two-and-a-half to four times the theoretical amount of useful work done. Their efficiencies, however, compare very favourably with some of the other examples of lifting machines, as A, F, and G.

The vibrating conveyor (L) appears from the table to be an inefficient one; but, in fairness, it must be said that the primary use to which this particular machine is put is screening and not conveying. As a screen it has given excellent results; and its efficiency as a conveyor would, no doubt, be higher if its length were greater.

The following diagram shows graphically the ratio of the useful work done to that expended in overcoming the friction due to the weight of the moving parts and in overcoming the extra friction due to the load.

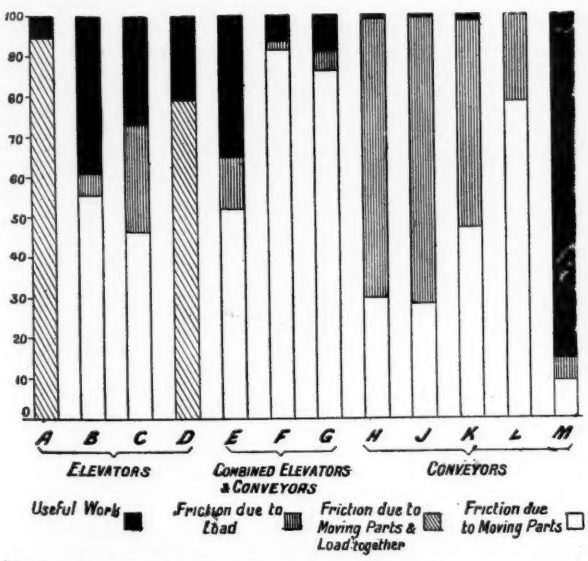


Diagram showing the Ratio of the Useful Work done to that expended in Overcoming the Friction due to the Moving Parts and that due to the Load.

Costs.

An attempt has been made in Table II. to tabulate the capital costs and annual charges for interest, maintenance, attendance, and power in respect to the machines given in Table I. These costs are in many cases actual; others are estimates based on experience, and are believed to be approximately correct. The table also shows the period of time during which each transporter has been working, and the weight handled per annum. The cost per ton of material handled and the cost per 100 foot-tons of useful work done are also included.

In comparing the costs per ton, it must be remembered that in no case has the machine been worked to its full capacity. For example, the cost per ton of working the crane and grab would be only 1·35d. if worked at the rate of 30 tons per hour, and in respect to the gravity-bucket conveyor the cost would be only ½d. per ton if worked for ten hours per day.

The costs given in the last column of Table II. are on a more equitable basis for comparison, as the distance through which the material is transported, as well as the weight of the material, is taken into account; also the same number of working hours per annum has been taken in each case. The inferences to be drawn from the tables must not be held conclusive, without due consideration of all the conditions under which each transporter has been working.

Discussion.

The PRESIDENT (Mr. Edward Allen), in opening the discussion, remarked that he was not able to follow the usual course of asking questions, as in this case the machinery which had been dealt with in the paper was quite familiar to him, and was under his constant personal observation. The author had dealt with the various systems in a strictly impartial manner. Each had special features that justified its selection; and though comparisons of efficiency and cost had been given, and afforded valuable information, the systems were not, strictly speaking, comparable. He desired to draw special attention to the qualifying remarks made in reference to "costs." Though in many cases these were actual, he was of opinion that, in regard to the transporters and the vibrating conveyor, there had been a larger expenditure on them during the period dealt with than was likely to be found necessary in future; and therefore the annual charges for maintenance and renewals would be lower than those given in Table II. The amount of useful work in some cases was shown to be very small; but in considering the matter, it was necessary to compare the amount of useful work done by the worst of these machines with the amount that could be done by the man with a barrow and shovel. While the paper had special reference to gas-works plant, he hoped it might be useful to engineers engaged in other spheres who had to handle coal or other materials in large quantities.

Mr. W. J. WILLETT BRUCE thought the subject of the transportation of fuel material very greatly concerned the marine engineer. Great strides had recently been made in the matter of coaling steamers. About five or six years ago practically nothing was done in Liverpool in this direction except by basket and hand; now it was the exception in the docks to find coal handled this way.

Mr. SAMUEL GLOVER (St. Helens) observed that by the kindness of the President, he had had the opportunity of seeing in operation all the devices which had been described; and he thought it would be well to bear in mind the fact that circumstances altered cases, and also to remember the purposes of some of the machines which showed so badly on the diagram. While they were conveyors in some senses, their greatest value was for work other than that of merely conveying the material. There was an axiom that the saving of the labour of one man all the year round justified an expenditure of about £1000; and he thought a great many of the machines described in the paper would justify expenditure in even greater proportion than this, because some of the work they did was such as could hardly be done at all by a man with a basket and spade. He had been somewhat surprised to hear the author give such a bad character to push-plate conveyors, and attributing to them the fracture of the coke. He thought that, when the author had had more experience of this form of conveyor, he would find it was not merely the work of conveying the coke along the trough by means of the cross-bars that broke the coke. As a matter of fact, the cross-bars seemed to only do a portion of the work of pushing the coke along, inasmuch as the cross-bars caught the large pieces of coke, and by their means a very much greater volume of the smaller coke was pushed along the trough without receiving any fracturing at all; and it was really a very efficient method of conveying even such material as coke, which was undoubtedly a difficult thing to deal with. From the description, it did not appear to him as quite clear whether the hopper which received the coke when dumped from the telpher could travel along the series of bunkers over which it stood, or how the several coke-hoppers in this long string were filled by one screen at the end of the row of bunkers; but he thought he would be right in assuming that it travelled along the series.

Mr. J. R. DAVIDSON said that, though possessing little knowledge of gas-works engineering, there were a few points of general interest to which he might refer. He had been interested to hear that, by means of the mechanical appliances described, it had been possible to effect a saving of 1½d. per 1000 cubic feet of gas; but his interest had been turned to disappointment when later on he found that the reduction in price was in favour of the Company, and not the consumer. Referring to the design of the boot of the bucket-elevator, he had had some experience in elevating material of a harder nature than coal—viz., hard stone, crushed—and originally an elevator was used which scooped the broken stone, and which had a form of boot similar to the one described. Obviously, there was a great deal of wear on the buckets with this type of machine; and it was very soon discarded in favour of a continuous belt with buckets close together, into which the stone was delivered by a shoot. The delivery from the shoot was so

perfect that it would run for many months before requiring to be cleared out; and there was very much less wear and tear in this type than in the case of the one that scooped the stone out. With reference to the efficiences worked out in the paper, he did not quite understand why the weight of the waggon, or the moving part, was taken into consideration in arriving at the amount of useful work. It would appear to him that the useful work was that of transporting the coal or other material, and not that of moving the waggon. A plant that required more work to move the scoop or bucket than another, and yet transported only the same amount of material, was surely less efficient. Possibly, he had misunderstood this point, as the author had explained some of the low efficiencies as being due to the heavy weight of the scoops, and had said that, in one case, the scoop which had to be lifted weighed 24 cwt., and the weight of coal only 15 cwt. In arriving at this standard, he had said that, in regard to horizontal transport, "the useful work has been taken to include the work of moving the waggon and load in one direction, and the work of returning the empty waggon in the other direction." Why the waggon moving in either direction should be taken into consideration, he was at a loss to understand.

Mr. GIBSON, in reply, agreed with the President that the figures for maintenance and renewals of the transporters were on the heavy side. He had leaned to the heavy side rather than the light in all figures under this heading, as he did not wish anybody to be misled and to assume from the table that he could work in any way, and then find in actual practice that he was unable to arrive at these results. To some extent, he agreed with Mr. Glover's remarks on the question of the push-plate conveyor illustrated in the paper; but he thought it was evident on the face of it that such a conveyor must cause a tremendous amount of friction, and a certain amount, at any rate, of breakage, though he had no actual experience of the working of this particular conveyor. In regard to Mr. Glover's question as to the screen over the hoppers, the screen travelled along the whole length of the hoppers, so that it could be moved to any point and the hopper filled as required. With reference to Mr. Davidson's observation in regard to the elevating of stone, he would be interested to know at what angle the elevator which he had referred to was fixed.

Mr. DAVIDSON replied that the elevator was nearly vertical.

Mr. GIBSON thought that the buckets must have been specially designed to receive the material. It was scarcely on the same lines as a coal-conveyor, though some coal-conveyors did receive their coal in a similar way to that described by Mr. Davidson. The closed boot referred to in the paper was a very bad one, as had been shown by experience. It had caused a considerable amount of jamming, and the elevator had been brought to a standstill, the buckets having to be emptied, and thereby causing much unnecessary labour; whereas if the bottom of the elevator were quite free, there was no difficulty of this kind. The buckets simply scooped the coal up from the bottom, just as a shovel would do. With reference to efficiencies, Mr. Davidson had said that he could not understand why the weight of the waggon had been taken into consideration in respect of horizontal transport. The reason was that it would be impossible to move the material unless there were some vehicle in which to move it. It would have been taken into account in the case of the vertical lift; but, as he had explained, no account had been taken of it, because the weight of the buckets descending was balanced by the weight of the buckets ascending.

Mr. DAVIDSON agreed that work was done in moving the waggons backwards and forwards; but he could not see how any useful work was done.

Mr. GIBSON replied that the calculation which he had given was only intended for purposes of comparison. He had taken the weight of the waggons as a very small amount—only one-half that of the load moved; and for comparison purposes, it had seemed to him to be better to include the weight of the waggon than to omit it. Possibly he was wrong in doing so.

Gas and Oil Engine Industry Last Year.

In the course of an interesting "Review of British Engineering in the Past Year" in the Engineering Supplement to "The Times" last Wednesday, the following remarks were made on the position of the gas and oil engine industry: "The year 1910 will rank as one of the most prosperous within the annals of the gas and oil engine industry. The volume of work had been falling from 1906 onwards. But the corner was turned in 1909; and in the past year there was abundance of work. As an evidence of this, it need only be mentioned that the National Gas-Engine Company report a 25 per cent. increase in the aggregate of horse power of engines built; Messrs. Fielding and Platt have found it necessary to double their erecting shop accommodation; Messrs. Tangyes report the year as having been exceptionally busy; and the same condition of affairs has been experienced by Messrs. Ruston, Proctor, and Co., and others. As regards gas-engine design, the most interesting feature is the widespread adoption of governing by varying either the quality or the quantity of the gaseous mixture in place of the hit-and-miss system of governing which was formerly prevalent in this country, and which persisted here long after Continental engineers employed other methods. Improvements in oil-engine design are moving, as might be expected, in the direction of the Diesel cycle, as being more economical in fuel consumption than any other type."

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Monthly Meeting of the Western District Division of the Scottish Junior Gas Association was held in Glasgow on Saturday evening—the PRESIDENT (Mr. J. Frazer, of Provan) in the chair.

GASHOLDER CONSTRUCTION.

Mr. J. TAYLOR (Glasgow) read a paper on the above-named subject. He explained that it was not one on the designing of gasholders, but he was going to deal with things which had come under his observation during the last fourteen or fifteen years. The paper was as follows:—

Before entering on my actual subject, let me just remind you somewhat of the history of gas in Glasgow. In the early days, Glasgow was supplied with gas by two competitive Companies. The Glasgow Gaslight Company were the first in the field; and in 1818 they began to supply Glasgow. Unfortunately, no record of the quantity manufactured by them was kept for over nine years —*i.e.*, until 1827. This year marks the introduction for the first time of some means of recording the amount of gas made. In this year, there were made about 80 million cubic feet. The year 1843 is noteworthy; for it was then that a second Gas Company sprang into existence. The Glasgow Gaslight Company found a competitor for the first time in 1843, in the City and Suburban Gas Company. These two Companies continued to supply gas in competition from 1843 until 1869, when the Corporation took over the works. The following figures show the development in gas manufacture and reduction in price since the Corporation acquired the works:—

Year.	Make in Cubic Feet.	Price per 1000 Cubic Feet
1869	1,206,921,000 ..	4s, 7d.
1890	3,058,277,000 ..	2s. 6d.
1910	6,977,904,000 ..	2s. 0d.

Only the structional ironwork of gasholders will be dealt with in this paper. The gasholders erected at the Temple works in 1893, and at Tradeston in 1896, have a capacity of 5,000,000 cubic feet of gas; and both were at that time the third largest in the world. They were surpassed by New York with its mammoth 15,000,000 feet holder, and East Greenwich with a 12,000,000 feet one. Glasgow's two Provan gasholders hold 8½ million cubic feet each; and at present there is one in course of erection in Manchester with a capacity of 10,410,000 feet. In 1898, it was decided to erect new gas-works at Blackhill, to cost about £1,000,000. The holders there, as well as the magnificent works, were designed by the late Mr. William Foulis. The holders are in three sections, on the telescopic plan.

The holders at Provan are constructed of best Siemens-Martin mild steel, capable of bearing a tensile strain of not less than 26 tons and not exceeding 30 tons per square inch, with an elongation of 20 per cent. in a length of 8 inches. About the first thing that is attended to in the building of these cylindrical vessels is the tracing of the cope and scribing marks where the tank-guides are to be fixed. With radius, which in this case is 142 feet, and plummet hung at the end, marks are placed behind guides. Then, with a rod accurately made, the centres of the guides are marked off. There is no difficulty now in placing the guides, 60 in number, 30 of which are in a line vertical to the standards. They are formed by channel-bars, 6 in. by 3½ in. by ½ in., fixed to cast-iron brackets by ⅞-inch bolts. The guides are placed, and set to marks on the cope-stone, plumbed in all directions, and kept in position by hard wood wedges, after which they are built in and grouted up with cement. It is necessary that these should be carefully set, as the sections are set at equal distances from each other.

The outer lift was first laid down, and is 280 feet in diameter by 50 feet deep. The bottom curb consists of two angles, 6 in. by 6 in. by ½ in., and two plates 9 inches broad by ½-inch thick, riveted to each of the angles. The plates and angles are riveted together and to the bottom course of the plates. These sections of the curb are broken banded, and have suitable cover-plates over each joint, and form a continuous ring round the holder; rivets being countersunk at the bearing-stones. Sixty bottom roller-carriages are fixed between the angles of the ring, and consist of bent plates 1 inch thick, stiffened by a T bar 5 in. by 2½ in. by ⅜ in. on each side, riveted to the side-plates, and bolted to the curb-plate. The rollers are 18 inches in diameter by 4 inches broad, and turned on the face. The bottom row of plates is 2 feet broad by ⅜ inch thick; while the top and next to the bottom row between stays are $\frac{5}{16}$ inch thick and 2 feet broad. All the intermediate rows are No. 9 S.W.G., weighing 5·87 lbs. per square foot, and about 3 ft. 7⅞ in. broad; there being only one plate in each row between the stays.

The sides are formed of 60 upright stiffeners, which are made of ¼-inch plate 18 inches broad; and, for the purpose of stiffening, a U-shaped section, stamped at both ends, is riveted outside, between the cup and the grip of the outer and middle lifts. In addition, a 6 in. by 3 in. by ½ in. channel is riveted to the inside of the stiffener-plates; the channel having an angle bar 3 in. by 2½ in. by ⅜ in. on both sides. These channels are for the bottom rollers of the middle shell to work in, and for guiding the middle shell. The stiffeners have holes drilled top and bottom, to admit gas to the interior. In preparing these thin sheets, in order to avoid too much scaffold riveting, two of the stiffeners are placed horizontally and parallel, high enough for a man to get beneath them to hold

on the rivet-heads. These two stiffeners are temporarily braced, and plated in the ordinary way, when all the horizontal seams are riveted, with the exception of the centre seam; thus forming a slab about 284 square feet in area. The rivets are $\frac{5}{16}$-inch charcoal iron, and are riveted cold. These slabs were usually prepared beforehand, so as to allow the plating of the various sections to go on without intermission.

Between these and all similar plates there was placed a strip of cloth saturated with red and white lead in equal proportions. All joints of $\frac{1}{2}$-inch rivets and upwards were riveted by the pneumatic hammer, and caulked by the same means. Let me say here that rivets in gasholder and tank work have to discharge a different duty from that which they fulfil in girder and ironwork structures. They have to hold two sheets or plates firmly together in a tight joint; whereas in structural work they have to bear a shearing strain. In both cases, it is necessary they should fit the holes tightly; and this is one of the points to which an inspector of riveted work must pay particular attention. When loose riveting is found in plate work intended to hold water or gas, it not only means a leaky seam, but also leaks round the head and point. The method of testing is by striking every rivet a light blow with a hammer, when the loose ones will be detected. A caulking-tool run round the edge of the rivet-head will prevent the jarring of the inspector's hammer; and unless the marks of the caulking-tool are specially looked for, it is difficult to see them. Another way of tightening up a loose rivet is by placing the snap sideways upon the point, and striking it a smart blow or two with a hammer. It will then appear to be tight—partly because it is bent, and partly because the snap cuts a ridge in the plate, and jams the metal against the rivet. It is advisable to look to the held-up head of the rivet, if possible, instead of the snapped head. A badly-heated rivet is often loose at the head, though snapped tight at the point. Unfair holes are one of the main causes of loose riveting; and therefore a moderate use of the drift may be permitted in most riveting work, though engineers are averse to it. Then, again, how frequently does one meet with designs in structural engineering which are impracticable, as, for example, when rivets are shown in places where efficient riveting is an impossibility? "The red-leaded tape and the coats of paint, to say nothing of a possible rubbing of red lead on the inside edge of the joints, often keep the joints tight until the holder has gas in it, and is at work, and often until the contractor is discharged from further liability."

To prevent the escape of gas between the various sections, cups to contain water are provided; and they form concentric grooves, which pick up water from the tank as they rise from it. The next lift has a corresponding grip or inverted cup; and these form a seal. The outer grip is formed of $\frac{5}{16}$-inch plates about 9 ft. 10 in. long; the plates being bent. It is 21 inches deep, 12 inches wide inside, and a cast-steel rest-block 6 inches broad by $1\frac{1}{4}$ inches thick is riveted to the centre of each plate, to receive the weight of the other lifts when fully inflated. These blocks are to prevent any tear and wear on the plates. A binding hoop 2 in. by $\frac{1}{2}$ in. is riveted on the inner edge of the plate. All cup and grip plates are machined at their butting edges, so as to fit close together. They have outside cover-plates 5 in. by $\frac{3}{8}$ in. riveted to each plate. Thirty roller-carriages are bolted to the side of the grip, and 30 on the middle of this lift. The rollers are 20 inches and 18 inches respectively. All rollers are lined with brass $\frac{1}{2}$-inch thick, are turned on the rims, and have the face slightly rounded.

We now come to the second section of the holder, which is 276 ft. $10\frac{1}{2}$ in. diameter by 50 feet deep. The cup-plates are about 9 ft. 9 in. long by $\frac{5}{16}$-inch thick, and are similar to grip. They came from the contractor's works riveted in threes; thus reducing the field riveting. These pieces were laid on timber off rest-stones high enough to allow the riveting and caulking of the cup-joints. The bottom rollers are meantime being set, and holes drilled for fixing. There are 60 rollers, each 10 inches in diameter. The carriages are all made of cast steel. The rollers run up the channel-guides on the outer lift. In a word, regarding the holes that are intended for the bolts which fix the carriages, I would suggest that these, and all bolts in cups, be a driving fit, leaving no chance of leakage from this source. Though most engineers specify some sort of joint or packing on bolt-heads, it has been my experience that frequently, if the thread is at all tight, the bolts turn and cut the packing away; and some men at least who are entrusted with this part do not take the bolt out to renew the packing—the result being serious leakage. After riveting and caulking, the cup is lowered on to the rest-stones, and is filled with water as a primary test, to detect any leakage.

The framing is now begun (the stiffeners being similar to those on the outer lift), plating started, sheeting or plating being well formed before riveting the vertical seams, which were also set up by a pneumatic riveting hammer. Both riveter and holder-on are responsible for the caulking of the plates. The scaffold is suspended from the top of the tank-walls with block and tackle, and is worked from the top downwards; each squad of men lowering their own platform.

The inner and last section is now begun. The cup is treated in the same way as the former one. This lift is 273 ft. 9 in. in diameter and 51 feet deep. The sides are formed of 60 ⊢ beams 10 in. by 5 in. They take the place of the former stiffeners, and are 50 ft. $2\frac{1}{2}$ in. long in one length. To each of these beams is riveted a $\frac{1}{4}$-inch plate 18 inches broad. The top and bottom courses of plates between these uprights are $\frac{5}{16}$ inch and 2 feet and 2 ft. 9 in. respectively. The intermediate courses are No. 9 S.W.G. On the $\frac{1}{4}$-inch upright plate, and opposite each standard of the framing, there is a plate 6 in. by $1\frac{1}{16}$ in., and flush riveted, forming a roller-path for the guide-rollers attached to the top of the middle lift. The top curb is formed of $\frac{3}{4}$-inch steel plates, about 9 ft. $6\frac{5}{8}$ in. long, and is bent to a radius of 2 ft. 3 in. These plates are machined at their butting edges, and cover-plates 2 inches broad are double riveted to each plate with $\frac{7}{8}$-inch rivets.

A girder is fixed round the inside of the curb, and is formed of two plates 18 inches broad by $\frac{3}{8}$ inch thick, with four angles 4 in. by 4 in. by $\frac{1}{2}$ in., and is riveted to the $\frac{3}{4}$-inch plates with suitable cover-plates, thus forming a continuous ring round the curb. An angle 6 in. by 4 in. by $\frac{1}{2}$ in. is rolled to suit the crown of the holder, and is riveted to the $\frac{3}{8}$-inch course of plates which forms part of the crown. To this angle is riveted a plate 12 in. by $\frac{3}{8}$ in. thick, stiffened at the lower edge by a 3 in. by 3 in. by $\frac{3}{8}$ in. angle; and 60 gusset stays are securely riveted to these girders, and to the vertical ⊢ beams. Though by the naked eye we cannot detect the movement or behaviour of the curb when the stress is on, our perception not being sufficiently acute to notice the minute changes that take place, still a change does follow. The range of temperature in this country will cause a difference in length of the curb of about $3\frac{1}{2}$ inches.

In a paper in the "JOURNAL OF GAS LIGHTING," by Mr. F. H. Robinson, last month, it is stated that "the top curb is subjected to great compound stresses, and must therefore be very rigid, so that no distortion may take place in a high wind, when the holder is fully inflated. The forces acting on the curb are as follows: (1) The pull of the top sheets caused by the pressure of the gas on the under side of the crown. (2) The wind pressure acting horizontally on the side sheets, and transmitted to the curb. (3) The weight of the side sheets, outer lifts, &c., acting in a downward direction. (4) The pressure of gas on the side sheets from within acting in a horizontal direction. The resultant of these forces is found to cause compression in the curb."

The crown is a true segment of a sphere, 400 feet radius, and is untrussed. The outside row of plates, as I said, was $\frac{3}{8}$ inch thick. Next follows a $\frac{5}{16}$-inch plate, all other courses being No. 8 S.W.G., with the exception of the course next to the crown plate, which is $\frac{1}{4}$-inch thick; the centre-plate being $\frac{1}{2}$ inch thick and about 8 ft. 2 in. diameter. These crown sheets, all of No. 8 S.W.G., are cold riveted, as well as the side sheets; the number of sheets varying from 20 to 200 in each course. A framing of timber is erected inside the holder, for building the crown, and in case at any other time the holder requires to be entirely lowered. Thirty swan-necked carriages are fixed to the top curb; the rollers being 30 inches in diameter and 4 inches broad. These carriages only have slotted holes in the cheek, to allow for roller adjustment. A cast-steel block for carrying the rollers is accurately fitted. The sliding-block is actuated by a 2-inch screwed pin with a locking-nut. In the case of all pins which carry rollers above the water-level, provision is made for lubricating. A hole is drilled to the centre of the pin; a similar hole is drilled at right angles with a gutter cut on the side of the pin; and a Stauffer lubricator is screwed into the hole in the centre of the pins.

Regarding the efficiency of tangential rollers on gasholders, sometimes adopted in large ones, in a descriptive article in an engineering paper, in 1881, of a gasholder for London, reference is made to the French system of guide-rollers, which, for the first time at least in this country, have been combined with radial rollers. The effect of the combination is that, whereas with radial rollers only the whole force of the wind against a gasholder bears on about one-fourth of the number of columns, where tangential rollers are adopted, the force is distributed on about one-half. The union of the two systems distributes on three-fourths of the columns or standards the stress resulting from the wind pressure, thus thoroughly supporting the gasholder, without any tendency to distort the guide-framing.

The guide-framing consists of 30 steel standards, 152 ft. 6 in. high, 9 ft. $\frac{3}{4}$ in. wide at the base, tapering to 2 ft. $1\frac{1}{2}$ in. at the top. These are bolted to the tank walls by eight bolts, $2\frac{1}{4}$ in. screwed, reduced in the body to the bottom of the thread, 12 ft. $10\frac{1}{2}$ in. long. The bottom ends are held by anchor plates, which have been built into the brickwork. Square tapered holes, formed by wooden boxes, are left in the brickwork for the insertion of the bolts described. The standards are tied by four tiers of lattice girders, and braced together, with the exception of the top girder, which is a single girder 3 feet deep. The first and second rows are 3 ft. 6 in. deep; each girder being formed of two angles 6 in. by 6 in. by $\frac{3}{4}$ in., braced together by diagonal bars 4 in. by $\frac{1}{2}$ in. flat, fastened by $\frac{3}{4}$-inch rivets. The third row is similar to the first and second rows, and is 3 feet—all, in turn, being riveted to the web plates of the standards. The bracings consist of flat bars of various dimensions, secured to the front members of the standards by two plates, one on each side.

Guide-runs for the rollers to work in are fixed to the front of each standard, and are formed of channel bars 6 in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$ in., having an angle bar $4\frac{1}{2}$ in. by 3 in. by $\frac{3}{8}$ in. riveted to the channels. Cast-iron packing-pieces, varying in thickness, are fitted between the standards and guide-runs. Each packing-piece was measured and cast for its own place; the work of plumbing being thus reduced to a fine art. These packing-pieces are securely bolted by four $\frac{3}{4}$-inch bolts through the angles at the side of the channels and to the standard. The inlet and outlet pipes are 42 inches in diameter, and rise above the water-level in the tank; being stayed to the timber framing with suitable glands. Pumps and valves are provided on both the inlet and the outlet pipes. A ladder is run to the top of the framing, having a landing at each

row of girders. In addition, a platform is fixed to the curb plate, to effect a landing on to the crown.

The sheets of the gasholder receive one coat of boiled linseed oil, and all other steel work one coat of approved paint, before leaving the contractor's yard. The gasholder and framing receive two coats of metallic paint after erection. All paint should be carefully applied and well worked in; and the somewhat common method among contractors of employing cheap labour to use plenty of paint and get the work finished quickly, should not be allowed. If the first few coats are not properly applied, the work will never be adequately protected without burning and scraping all the defective paint off; and even if this were done, it is questionable if such a good job could ever be made as might, more easily, have been done at first.

Spiral-guided, or columnless, holders have, to all appearance, come to stay. Messrs. Clayton, Son, and Co. were, it may be remembered, the builders of the first successful spiral-guided holder, which was erected at Northwich, Cheshire, 22 years ago, and has worked well during the whole of this period, and still continues to give the greatest satisfaction.

A number of views of gasholders under construction were shown on the screen.

Discussion.

Mr. A. H. Whitelaw (Glasgow) said the outstanding feature of gasholder construction was, in his opinion, the necessity for having on the job a first-class man to see that the right material was put in and the right workmanship employed. Mr. Taylor had drawn their attention to the fact that bad riveting and bad rivets could cause a good deal of harm, more particularly after the red lead was washed away, and the holder taken off the contractor's hands. Then all the defects were shown up. One thing about a holder which struck him was its tremendous stability. He did not think there was any storm that could possibly occur which would cause gasholders to budge a quarter-of-an-inch. This was as it should be. They knew what enormous damage wind could do. If it could blow down a Tay Bridge, it might affect a holder. He did not think many there would believe the curb in the inner lift was in compression. The more they thought of it, the more they were convinced that this was bound to be the case, because they had the weight of the side sheets acting downwards, and the pressure of the gas acting normally on the crown; and these two forces alone, apart from the pressure of the gas horizontally on the sheets and the pressure of the wind, had a tendency to straighten out the curb. It was this tendency which put the curb under compression, though it might seem at first sight that they might have it in tension. From Mr. Taylor's remarks, he could see he was not in favour of doing away with the guide-framing of gasholders; and he (the speaker) considered that in this he was quite wise.

Mr. F. Cuthbert (Kirkintilloch) was in accord with the author as to the desirability of arranging the rivet-holes so as not to have them in inaccessible places, because efficient riveting could not be done there, and men slighted their work. Mr. Taylor also remarked about having the rivets tight in the holes—a very important point indeed.

Mr. J. Wilson (Falkirk) wished to know if it was the case that in the erection of the last big holder the question was put as to the advisability of riveting by hand, as being better than using an automatic riveter; that this was tried, and found to be erroneous; and that the automatic riveter made a better job than ordinary hand-riveted work? With regard to spiral-guided holders, there was a little "dodge," he might call it, to help the paint work. When they had heavy rain, the water came rushing off the top and down the sides of the holders; and this tended to destroy the paint. The guides going up the sides of the holder formed what might be called gutters; and if a ridge of cement, or something of the kind, were made round the top of the crown, with openings at the guides, the water, instead of rushing down the whole of the sides of the holder, would merely run down the guides. In this way, much wear and tear of the paint was saved.

The President, referring to Mr. Whitelaw's remark as to the ability of the men, said the ability of the man who was an inspector was the strength of his mind; and he knew that Mr. Taylor was a very strong-minded man. He spoke about having fitted bolts on to rollers. No doubt Mr. Taylor had given the matter a great amount of consideration; and it went to prove that the inspector's work at all times was a very thankless task. He could not impeach Mr. Taylor with having shirked his duty in any way, yet the fact remained that at Temple, and also at Provan, they had quite a number of bolts leaking, due to the cause Mr. Taylor had stated. The nuts might be tight on the bolts, but the bolts might be slack in the holes. They had suffered from this even at Provan. There were quite a number of brackets where they had had to force wedges between the plates and the bracket, and pack them in with specially prepared red lead putty, with ordinary white gasket. He might say it was a great annoyance to them. Regarding wood framing, he should be inclined to think Mr. Taylor did not do it justice. He should have thought the author would have said a good deal more about it, because the wood framing inside the holders at Dawsholm, Temple, and Provan was a very nice piece of work. The whole thing, when looked down upon, seemed to have the appearance of an umbrella stripped of its covering. Wood framing did away with the extraordinary weight due to the former trussing of the crown. The two original gasholders were trussed; but when they were rebuilt this was done away with. Painting was a very serious matter; and Mr. Taylor could bear him out in what he said regarding it. Contractors would paint even on a frosty morning, if they were allowed to do so. Mr. Taylor pointed out that in the specifications issued to contractors it was required that the sheets should have one coat of boiled linseed oil. He considered this was one of the greatest mistakes that could be made, for the simple reason that to coat a steel sheet with boiled linseed oil was to prevent the weather getting at the mill scale; and so ultimately the moisture, coming from the inside, got between the scale and the sheet, and the scale dropped off. This was a thing which ought to be avoided. If he were an engineer, and were issuing specifications for a holder, he should certainly say that the plates were not to be coated with oil or paint until they were twelve months old. He would allow the steel to rust, scrape it, and give it three coats of paint; and in this way there would be a much better job. He proposed a vote of thanks to Mr. Taylor for his paper, and for the excellent lantern views that he had shown during the evening.

Mr. Taylor remarked that Mr. Doig Gibb had written a pamphlet about painting, and the President had expressed Mr. Gibb's ideas exactly regarding paint in plate work. It was a debatable point, even in higher Associations than their own small concern. Engineers were considering whether steel should be coated before or after it lost what was called the roller scale. He had often thought that to paint it before was to put on so much paint just to have it scraped off when the holder was completed. Timbering a tank seemed to be such a costly piece of work to tackle for twenty, thirty, or forty years, without any use. But it was certainly needed, on account of the thinness of the sheeting, which was only No. 8 S.W.G.—a little over one-eighth inch in thickness. He had had some extraordinary experiences with leaking cups. He had seen a cup emptied the third time without any trace of leaks being discovered; and the contractor concluded that perhaps a syphon had been left in the cup, and that this was drawing off the water. But when a little gas was turned on, two very serious leaks were soon discovered. This went back to fitting the bolts tightly in the cups. Besides, the steel carriages in the bottom cups must be an absolute fit, so that any strain coming on the grip in the cup would separate it from the bolt-head; and it did so in this case. He had another experience of a cup and the carriages badly fitted round the bottom circle. After bringing a little pressure to bear on the engineer, they were allowed to heat the cup with a miniature fire locally. They placed the carriages on over the bolt-holes, and ran it up with a special non-contracting metal; and they got an excellent job. In his opinion, the pneumatic riveter had one serious drawback—the joints must be drawn out absolutely before the riveter went on. A hydraulic riveter squeezed the parts together—nothing better; but with the pneumatic riveter the joints must be absolutely close before it was applied. The question of doing away with guide-framing had not given him very much concern. He pinned his faith, almost absolutely, to the standard framing; and they saw present-day engineers, men of standing, doing as they did at Provan—that was, carrying the structural framing to the top of the inner lift. He would mention only one thing with regard to columnless holders. Those who contemplated adopting them required to consider the matter well, and have a man who could work out the strains and stresses, before they committed anything to paper.

"Transactions" of the Institution of Gas Engineers.

We have received the "Transactions" of the Institution of Gas Engineers for the past year. The volume contains a full report of the proceedings at the annual meeting held in London in June, under the presidency of Mr. James W. Helps, M.Inst.C.E., the Engineer and General Manager of the Croydon Gas Company, and an account of the visit of the members to the Company's works, and also of a large party of their colleagues of the German Association of Gas and Water Engineers to this country later in the year. Noteworthy features of the contents are the second report of the Gas Heating Research Committee; a report of the Carbonization Committee, containing an account of some investigations with respect to carbonizing in horizontal retorts carried out by Mr. J. Ferguson Bell, M.Inst.C.E., of Derby; and a report by the Refractory Materials Committee, with a standard specification for the manufacture and testing of retort materials, drawn up by a Sub-Committee of that body. The usual abstracts are given of papers which have appeared in the "Journal" and in other periodicals; and these are followed by notices of the life-work of members lately deceased. The other matter includes a report of a meeting of the subscribers to the Livesey Memorial Fund, a list of contributors to it, the names of the Advisory Committee on the Livesey Professorship at Leeds University, and the usual list of officers, council, committees, and members of the Institution, and the officers and committee of the Benevolent Fund. The volume, which has for frontispiece, a portrait of Mr. Helps, has been produced under the editorship of Mr. Walter T. Dunn, the Secretary of the Institution.

A course of special lectures to be given in the Engineering Department of the Manchester University includes four by Mr. Dugald Clerk, M.Inst.C.E., F.R.S., on the "Internal Combustion Engine." The first will be delivered next Thursday, and the others on succeeding Thursdays.

INDUSTRIAL PYROMETRY.

In the second of the series of Cantor Lectures on the above-named subject delivered by Mr. Charles R. Darling before the Royal Society of Arts (*ante*, p. 40), he dealt mainly with thermo-electric pyrometers.

The lecturer began by pointing out the difficulties which for a long time stood in the way of the production of a successful thermo-electric pyrometer, and showing how the problem was eventually solved by Le Chatelier, who, in 1886, introduced a pyrometer in which the junction was formed of platinum as one metal, and an alloy of 90 per cent. of platinum and 10 per cent. of rhodium as the other. This was used in conjunction with a D'Arsonval galvanometer, from the scale of which temperatures were read; and it was found quite reliable and satisfactory Shortly afterwards, Barus in America and Roberts-Austen in England showed that the rhodium-platinum alloy might, with equally successful results, be replaced by one made of platinum and iridium, containing 10 per cent. of the latter metal.

The galvanometer first used by Le Chatelier was of the moving-coil pattern, having attached to the upper suspension strip a mirror from which a spot of light may be reflected on to a scale. Most people who have been accustomed to work with mirror galvanometers would probably form the erroneous conclusion that these instruments could not be applied successfully in a factory, owing to the vibrations caused by the machinery or hammering. In the Royal Gun Factory at Woolwich, however, mirror galvanometers are now exclusively employed. They are of the Holden-D'Arsonval pattern, and are hung from a ring by means of springs. The advantage possessed by mirror galvanometers over instruments provided with a pointer is that a longer scale, and therefore a more accurate reading, is possible. Most users, however, prefer an indicator in which a reading may be taken by noting the position of a pointer attached to the moving part of the galvanometer; and the progress made in the manufacture of electrical instruments has resulted in the production of many accurate indicators of this type.

The lecturer next dealt with the question of the marking of the scale of the indicator, so that standard temperatures might be read off directly; and he then passed on to inquire into the capabilities and industrial uses of a pyrometer made and calibrated in the manner he had described. He pointed out that it frequently happens that a knowledge of the rate at which the temperature of a furnace rises is quite as important as the actual reading; and consequently it would be a manifest advantage if a continuous record of the temperature of the furnace over a given period could be secured. The first instrument for thus recording temperatures was designed by Colonel Holden, F.R.S., in conjunction with the late Sir W. Roberts-Austen; and it was intended for use with a mirror galvanometer. The Siemens-Halske recorder is applied to a galvanometer which carries a pointer attached to the suspension. At the end of the pointer is attached a small stylus, and at stated intervals, regulated by clockwork, a bar descends and presses the stylus on to a sheet of paper, beneath which is placed an inked ribbon—thus forming a dot on the paper. The bar then rises, and remains free of the pointer for a sufficient time to allow the galvanometer coil to swing into the position which represents the temperature of the pyrometer, after which the bar again descends and makes a second dot. The paper is fed forward at a definite rate by clockwork, and is divided horizontally into temperatures. The record obtained is permanent, and consists of a nearly continuous curve formed by successive dots. The same principle is applied in the "Thread" recorder, made by the Cambridge Scientific Instrument Company. The pointer is attached to the galvanometer suspension and the bar, which descends under the action of a cam. In this case, however, a V-shaped piece at the end of the pointer presses upon an inked thread, which is made to touch a graduated paper wound round a drum, rotated by internal clockwork. These instruments possess the advantage of giving a visible record.

In drawing his lecture to a close, Mr. Darling said that though time did not permit of a description being given of the many ingenious details which in late years have been devised with a view to eliminating the possible errors which might arise in the practical working of pyrometers, he could not, even in a general survey of the subject, omit some reference to the results obtained with thermal junctions composed of the cheaper metals. For temperatures not exceeding 700° C. (1290° Fahr.), a junction of copper and constantan gives excellent results, and costs little to renew. Up to 900° C. (1650° Fahr.), copper and nickel or iron and nickel are satisfactory; the latter metals being employed in Crompton's pyrometer. The Foster Company are now making an iron-constantan pyrometer to read to more than 1000° C., which costs little to renew if destroyed by continuous oxidation. Instances in which processes have been improved, money saved, and failures averted by the use of thermo-electric pyrometers might, he said, be multiplied indefinitely. The discovery of Seebeck, regarded at the time it was made merely as a scientific curiosity, had consequently led to results of the highest importance in modern industry.

Owing to a defective gas-pendant, considerable damage was done to a cottage at Mosley Common, Tyldesley, last Tuesday night by an explosion of gas; but the occupier escaped injury.

REGISTER OF PATENTS.

Cleaning Tools for Pipes and Tubes.

ADAMSON, R. A., of Rivington, near Bolton.

No. 27,812; Nov. 29, 1909. Post-Dated, Sept. 19, 1910 (No. 21,869).

This invention relates to a cleaning or scraping tool for pipes or tubes. The cutter is formed of bars fixed or hinged to a conical head. If the cutter bars are fixed to the head, the end of the bar nearest the head is hinged to enable the bar to spring slightly. At the further end of the bars are placed pins, which slide in sockets on the central bar of the cutter; and around the pins and sockets helical springs are arranged to keep the cutters pressed against the side of the tube. Nuts and washers are provided on the sockets to enable the strength of the spring to be adjusted as required. The ends of the bars nearest the spring are pressed inwards, and slide in slots in a disc arranged on the central rod; the disc preventing the cutters from opening sufficiently to allow the springs to become detached.

The end of the tool is inserted in the pipe, and given a rotating and advancing movement. The forward cutting member and the blades scrape off any scale or foreign matter in the interior of the pipe—the forward cutting member giving a lead to the blades and the springs keeptng the blades up to their work. The apparatus "cannot injuriously affeci the material of the pipes, but will thoroughly and conveniently clean them; and the debris passes freely towards the outlet end of the pipe."

The arrangement was referred to in the "JOURNAL" for Oct. 11 last, p. 138.

Discharging and Charging Gas-Retorts.

GUEST, A. A., and GIBBONS, W. P., of Dudley.

No. 30,131; Dec. 24, 1909. No. 15,351; June 27, 1910. Complete Specification of the combined invention, accepted Dec. 22, 1910.

This invention has reference to machines for discharging coke from one end of a double-ended horizontal retort simultaneously with the charging in of the coal at the other end of the retort—these operations being effected by one stroke of the charger.

Such discharging-charging machines, as heretofore constructed, the patentees state, all have the defect that the charge is not always delivered and distributed evenly along the retort, and, moreover, the construction of the discharging charger has been such that a portion of the charge of coal is dragged out of the retort by the removal of the charger, and particularly by the friction of the charge of coal on the side plates of the charger. These defects are said to be overcome by the improvements which are the subject of this combined patent.

The improvements comprise a charging trough somewhat longer than the retort and open top and bottom. It is made with substantially vertical sides and suitably supported and adapted to enter the retort, carry the coal therein, and push the coke therefrom. The charging trough has each of its sides formed of parallel side bars capable of independent sliding movements—the lower bars being adapted to be withdrawn wholly or partially from the retort before the upper bars are partially or wholly removed, or *vice versâ*. Thus the friction of the stationary bars against the sides of the charge of coal in the retort assists in maintaining the charge stationary while the other bars are being withdrawn. Suitable mechanism is provided for imparting forward and backward movements to the trough, and for removing the upper and lower sliding bars independently.

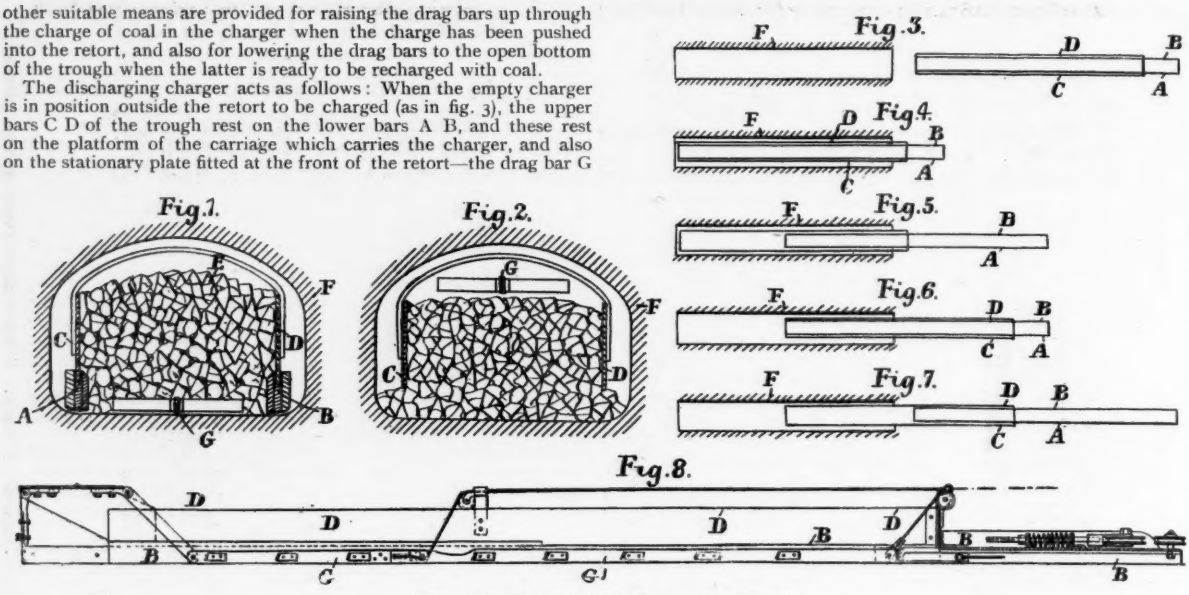
The invention also comprises the employment in the charging trough of longitudinal drag bars furnished at suitable intervals with cross bars forming scrapers. The drag bars are so mounted and arranged that as the charger makes its forward movement over the stationary plate at the front of the retort, the drag bar lies at the bottom of the trough at the bottom of the charge and serves to keep the charge together and deliver it into the retort. When the whole of the charge has passed into the retort, the drag bar is raised out of the charge and maintained in this position as the charger is withdrawn.

Fig. 1 [p. 170] is a cross sectional elevation of the retort and charging trough in position therein, together with a charge of coal. Fig. 2 is a similar view, showing the lower bars of the charger withdrawn and the drag bar raised to its highest position above the charge ready to be withdrawn with the upper portion of the charging trough. Figs. 3, 4, 5, 6, and 7 are diagrams to illustrate the operations of one form of the discharging charger. Fig. 8 is a sectional side elevation of one form of the discharging charger showing the drag bar in the position it occupies when charging coal into the retort.

Each side of the charging trough is formed of (preferably) two bars, fitted together one above the other so as to be capable of independent sliding movements. The lower bars A B (fig. 1) slide in the upper bars or plates C D. A B are both thick bars, each having in its top edge a longitudinal groove in which the bottom edge of the corresponding upper bar C D fits and slides. Each of the bars A B can readily be formed by riveting three thinner bars together side by side, as in fig. 1—the two outer bars being wider than the central bar, so as to project up above it and form the sides of a groove of which the bottom will be formed of the central bar. The upper vertical bars C D are maintained a proper distance apart by bridles or bridges riveted to them at intervals along the trough, and made of such a size as to enter the retort. Thus a bottomless open-topped trough is formed, the width of which is somewhat less than the width of the retort F. Hinged to the front of the charging trough there is a hinged push-plate (not shown) adapted to discharge the coke; and on the return movement, the push-plate turns up and rides over the top of the charge of coal in the retort. In the lower part of the trough formed by the side bars A C and B D (the bottom of which trough is open), there is provided a longitudinal drag bar G, furnished at intervals with light cross-bars fixed to it and forming scrapers and projecting laterally from the central drag bar, which is connected by inclined link bars at intervals to bridge-pieces or bridles fixed to the side bars, and extending across the trough from side to side, over the charge in it. Wire ropes or winding gear or

other suitable means are provided for raising the drag bars up through the charge of coal in the charger when the charge has been pushed into the retort, and also for lowering the drag bars to the open bottom of the trough when the latter is ready to be recharged with coal.

The discharging charger acts as follows: When the empty charger is in position outside the retort to be charged (as in fig. 3), the upper bars C D of the trough rest on the lower bars A B, and these rest on the platform of the carriage which carries the charger, and also on the stationary plate fitted at the front of the retort—the drag bar G



Guest and Gibbons' Retort Discharger-Charger.

being in the open bottom of the trough resting on the platform and stationary plate. As the charging trough moves forward into the retort, the coal falls down from the overhead hopper into the trough at the proper speed through a shoot near the front of the trough (as usual in other discharging chargers), and is carried forward with the trough into the retort by the friction of the charge against the sides of the trough and by the drag bar G, which moves with the trough. At the same time the push-plate at the front of the charging trough pushes the coke out at the other end of the retort. When the trough with the charge of coal has moved forward as far as required towards the other end of the retort (as fig. 2), the two lower side bars A B are withdrawn for a certain distance—say, about half the length of the retort, as fig. 5. The charge of coal remaining stationary in the retort is there held by the drag bar and by the friction of the charge on the bottom of the retort and against the side bars, which are (by preference) made of a greater depth than the lower bars, so as to expose a larger frictional surface to the coal than do the lower bars. The drag bar is now raised out of the charge (as fig. 2), and is between the top of the charge and the underside of the top of the retort. The side bars forming the upper part of the sides of the trough, together with the drag bar above the charge, are next withdrawn (as fig. 6) to the same distance as are the lower bars on which the upper bars slide; and while this operation is taking place, the charge of coal in the retort remains stationary. The lower bars are then further withdrawn right out of the retort (as fig. 7); the charge still being maintained stationary in the retort by the friction on the bottom of the retort and against the stationary side bars. Next the side bars are wholly withdrawn out of the retort (as fig. 3), leaving the charge of coal in the retort. As the side bars are withdrawn, the charge settles down to a certain extent and spreads out below the bottom edges of the side bars (as fig. 2), and thus leaves more room at the top of the charge for the removal of the drag bar. Thus "there is delivered an even and regular charge of coal throughout the length of the retort."

Mechanism for raising and lowering the drag bar between the trough sides can be arranged in various ways, but what the patentees prefer is the arrangement shown in fig. 8, where the drag bar G is made in two lengths marked respectively G and G^1, which are connected together by a cross pin. The two lengths constitute the drag bar, which is somewhat shorter than the two side bars. The front end of the drag bar is connected by an inclined link with an arched front plate fixed to the side plates and extending as an arch from one plate to the other—the link being at the centre. The other end of the drag bar is connected to a wire rope which passes over a guide pulley carried by the back cross plate fixed to the two side bars, and forms the back end of the trough. This wire rope is connected to another wire rope geared to a winding drum, and also extending forward and passing over a guide pulley. At its front end it is connected to the drag bar at a point intermediate between the link referred to and the back end. It will thus be seen that if there is sufficient tension exerted on the wire rope the drag bar will be lifted and the link will be caused to swing up, and thus the drag bar will be raised above the charge of coal.

District Pressure Governors.

PARKINSON AND W. & B. COWAN, LIMITED, of Birmingham, and LAYTON, A. E., of Redditch.

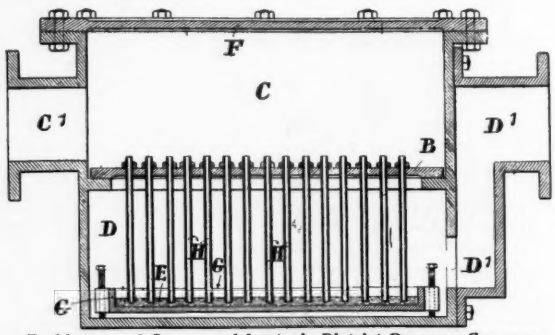
No. 30,238; Dec. 28, 1909.

This arrangement of district pressure governors is for use in hilly districts where the gas has a natural tendency to rise in the ascending parts and to increase the pressure prevailing at the summit of each incline in proportion to the steepness of the gradient.

The governor proposed is similar in construction to a gas washer or scrubber; the casing being divided into two parts, constituting an inlet chamber and an outlet chamber, by a horizontal partition, which carries a number of dip-tubes having their lower ends immersed in a variable depth of liquid through which the gas is compelled to pass on its way to the outlet. Thus the mercury, preferably used in place of any other liquid, offers a resistance to the passage of the gas and it also reduces the pressure—the amount of reduction being directly determined by the depth of the mercury resistance through which the gas has to be forced by the inlet pressure. Means are provided whereby the device can be adjusted to give any desired outlet pressure or to adapt it for controlling any gradient of ascending main, by varying the effective depth of the mercury in the resistance chamber.

The illustration shows a transverse vertical section of the governor; also the arrangement of the regulating chamber and the adjustable mercurial resistance therein.

The governor consists of a casing, of cylindrical form, partitioned off horizontally by a plate B into two chambers C D. The upper one receives the incoming gas by the inlet C^1, while the lower one (the regulating chamber) contains the mercurial resistance E, and has communication with the outlet D^1. The cover F and the partition-plate B are both removable, so as to admit of access being obtained to the regulating chamber.



Parkinson and Cowan and Layton's District Pressure Governor.

In the bottom of the regulating chamber is a tray or shallow well G, adapted to contain the mercurial resistance E. The partition B carries a number of vertical tubes or gas-conduits H (of any size or bore), arranged so that their upper ends all have free communication with the inlet chamber, while their lower ends are all immersed to a suitable depth within, and depend to the same extent into, the mercury in the tray. In this way, the gas which is forced down the tubes by the superior pressure prevailing in the inlet chamber is discharged from the immersed ends of the tubes into the mercury, and has therefore to force itself upwards through, or overcome the resistance of, the mercury above the discharge level before it can reach the interior of the regulating chamber and proceed thence through the outlet to the ascending main.

The resistance thus offered to the passage of the gas, and the resultant difference in pressure at the inlet and outlet, depends on the extent to which the delivery ends of the conduits are immersed within, or dip into, the liquid—in other words, upon the distance between the delivery ends of the tubes and the surface of the mercury in the tray. The pressure difference between the inlet and outlet therefore may be regulated as required by any means which will vary the distance between the lower ends of the conduit tubes and the mercury surface, and so change the depth of the effective head of the mercury. This can be done in the arrangement represented either by altering the quantity of mercury in the tray or by adjusting the height of the tray and its contents bodily and relative to the tubes or conduits. The same result may also be attained by adjusting the tubes themselves by raising and lowering mechanism or by an adjustable device for displacing the mercury to alter the level in its tray.

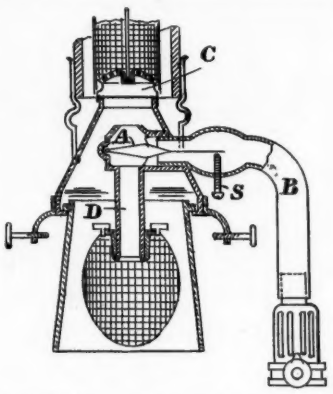
Combined Vertical and Inverted Gas-Burner.

LAMBTON, J. W., of Erdington, and FLETCHER, E. J., of Upper Clapton, N.E.

No. 739; Jan. 11, 1910.

This combined vertical and inverted incandescent gas-burner is arranged so that a supply of mixed gas and air flows downwards for

combustion within the inverted mantle and upwards for combustion within the vertical mantle. A device within the mixer regulates the amount of flow of mixed gas and air in either direction.



Lambton and Fletcher's Combined Vertical and Inverted Gas-Burner.

As shown, a pivoted vane or diaphragm A fits within the extended or conducting part of the mixer B in such a manner that, by tilting the diaphragm upwards or downwards, it causes more or less mixture to flow in either direction and thereby balances the supply to the top and bottom burners C and D. The diaphragm is formed with a tail-piece, which extends along the mixer as shown; the latter being preferably enlarged so as to give free room for it to be radially moved upwards and downwards by the screw S to an extent which will cause the diaphragm to close, when desired, either the top or the bottom part of the mixer extension or conducting part.

Manufacture of Producer Gas.

DOHERTY, H. L., of New York.

No. 7786; March 31, 1910. Date claimed under International Convention, March 31, 1909.

This invention consists in treating combustible gases (such as blast-furnace gases and Mond gas) containing an appreciable amount of carbon dioxide, by preheating the gas to a temperature sufficient to supply the heat required for the dissociation of the carbon dioxide, or to a temperature as near to such temperature as is practicable, and then passing the preheated gas through the fuel bed of a down-draught producer, whereby the carbon dioxide it contains is reduced to carbon monoxide with the production of a gas nearly free from carbon dioxide and which is particularly suitable for use in gas-engine and high-temperature work.

The object of the inventor is to economically carry out such treatment of the gas without the addition to it of a large volume of inert nitrogen. He therefore makes the crude gas in a producer and removes substantially all its water vapour, and then passes the major portion through a superheater which is heated by the burning of the minor portion. Thereafter the superheated gas is passed downwards through a deep bed of incandescent fuel which is kept at a temperature sufficient to reduce the carbon dioxide by the addition of a minimum of superheated air. The air that is supplied to the producers of the crude gas is superheated and is supplied with an excess of water.

Further particulars of the process are not now needed, as a full abstract (with illustrations) of the American specification for the same patent appeared in the "JOURNAL" for Sept. 6 last, p. 657.

Constructing Retort-Furnaces.

STETTINER CHAMOTTE-FABRIK AKTIEN-GESELLSCHAFT, vormals DIDIER, of Stettin, Germany.

No. 21,789; Sept. 20, 1910. Date claimed under International Convention, Sept. 30, 1909.

This invention relates to furnaces having large chambers, and more particularly to retort-furnaces for gas manufacture. Its *rationale* is thus stated by the patentees: "The introdnction of large furnaces has rendered it necessary to group together the greatest possible number of individual or unit furnaces; so that often ten or more furnaces are connected together to form one set. The expansion of the furnace masonry due to heating during the initial working of these large sets is so considerable that it can no longer be compensated for by the spring-anchoring hitherto used in sets of smaller sizes. Experience has clearly proved that furnaces situated at the ends of the group or set are exposed to particularly great expansion, which causes cracks, leaky joints, or breaking of the furnace masonry.

"According to this invention, this drawback is avoided by providing, during the erection of the furnace set, expansion joints in the vertical direction between each unit furnace or group of furnaces; these joints enabling the furnace chambers to expand to a certain extent in a lateral direction when the set or group is started.

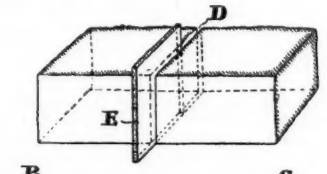
"Such expansion joints necessitate the provision of gaps, which must have a great length and height corresponding to the dimensions of the furnace. Since, in practice, difficulties are experienced in forming such gaps, according to this invention a yielding packing layer is inserted between each two furnaces or groups of furnaces in a set during their erection—the width of the layer corresponding to that of the expansion joints or gap. The packing or filling layer enables the proper distance to be maintained between the furnaces during their erection, and prevents mortar, pieces of stone, and other foreign bodies from falling into the gaps. Conveniently, the packing layer is in the form of plates of yielding substance; these plates being withdrawn on the completion of the furnace, so as to leave gaps of the required size. Alternatively, the packing layer is formed of compressed cork or other material, and is not removed from the furnace when the erection of the latter is complete; the material being of such yielding nature that, during the expansion of the furnace masonry, the packing layer is compressed from a half to one-third of its normal thickness. By providing gaps or spaces, the furnaces can expand laterally without any cracks, breakages, or leaky places being formed.

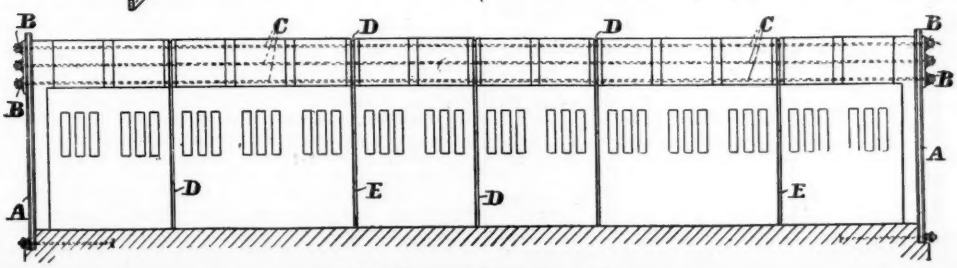
"When plates of yielding material are used during the erection of the furnace to maintain gaps of the proper dimensions, these plates need not necessarily be removed, but may remain in the gaps and be compressed when the furnace masonry expands in the same manner as the compressed cork already referred to.

"When material that can be carbonized—such as compressed cork—is used as a filling layer for the expansion joints between any two furnaces or groups of furnaces, complete carbonization of such layer during the starting of the furnace set can be effected by heating the furnace masonry to a considerable extent. In this manner, the furnace masonry is enabled to expand to a greater extent than in the case of a simple compression of the packing layer."

As an example of a construction according to this invention, a furnace set is shown, and a detail view in perspective.

The furnace set consists of fourteen single furnaces, which may be regarded as retorts. The furnace masonry of the set is held together, as usual, by girders A, arranged at the ends of the block and anchored to the ground, and by horizontal tie-rods C connected to the girders and provided with spring washers B. According to this invention, however, between each two furnaces or groups of furnaces expansion joints or gaps D are arranged in the vertical direction—the gaps enabling single furnaces or groups of furnaces to expand laterally, and, in some cases, containing a packing layer E of compressed cork or other material, which can be strongly compressed by the action of the lateral expansion of the furnace masonry.





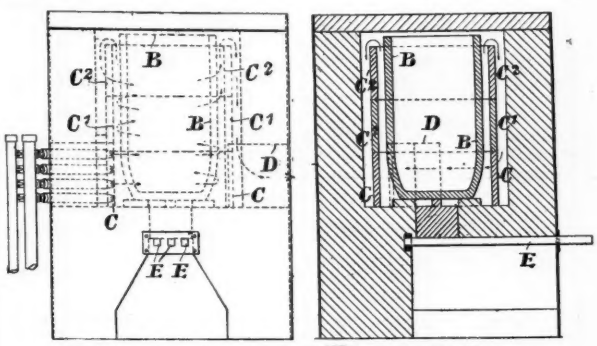
Stettiner Chamotte-Fabrik Retort-Furnace.

Gas-Fired Crucible Furnaces.

FLETCHER, RUSSELL, AND CO., LIMITED, and FLETCHER, T. W., of Warrington.

No. 9940; April 23, 1910.

This invention relates to the class of furnaces in which a crucible is placed within a cylindrical fire-clay shell with a baffle in it and gas-



Fletcher, Russell, and Co.'s Gas-Fired Crucible Furnace.

flames introduced tangentially, so as to be caused to pass round the crucible before reaching the outlet to the flue. The objects aimed at

are "to facilitate the removal of the retort with the molten metal from the furnace, and to enable any metal that may have escaped to the bottom of the furnace from an imperfect crucible to be recovered."

In the side view and cross vertical section of the furnace with the improvements applied, in the space between the wall of the furnace and the crucible B is a cylindrical baffle (in sections) C C^1, and C^2; the top section being divided vertically, so that some of the parts may be removed in order that there may be sufficient room for the clips to obtain a hold on the crucible when it is required to be lifted out. The gas-jets are placed so that their flames are caused to enter by burners passed tangentially through the wall and a closed passage formed in the space between the wall and the baffle and circulate first round the retort, then pass over the top of the baffle C^2, and descend in a circuitous course to the outlet D. The base of the furnace is formed separately and rests on bars E, which can be withdrawn when it is necessary to remove the bottom of the furnace from any cause.

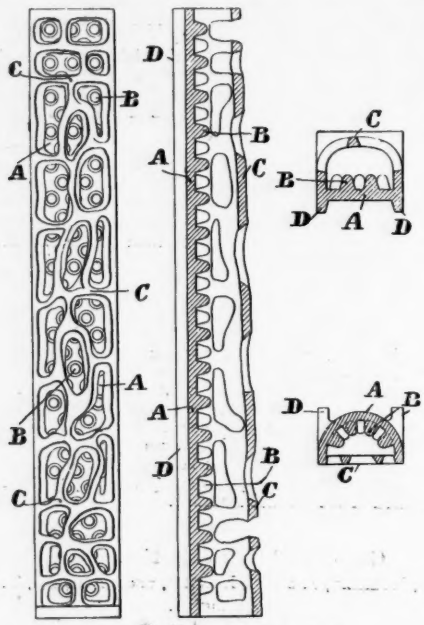
Fuel for Gas-Fires.

GLOVER, T., of Edmonton.

No. 11,357; May 7, 1910.

The object of this invention is to construct gas-fire fuel in lengths and of tubular form with open ends, in such a manner that the solid back may "become more brightly incandescent than is now the case with such fuel as at present constructed."

Front elevations and a cross section of a length of such fuel (at right angles to each other) are shown; also a section of a length of fuel with a curved instead of a flat back.



Glover's Tubular Gas-Fire Fuel.

The fuel is tubular and in lengths, with the front of the solid back A formed with projections B so as to catch the gas-flame. The front C of the fuel is open-work material, and may either be formed with or applied and secured to the back A; so that when complete each length of fuel is approximately of D shape in cross section.

Each length of fuel may be vertical when in position, with the front inclined; and the back may be provided with lugs D for keeping it at a distance from the back plate of the stove. The lengths of fuel are placed side by side; each length being positioned over a gas-nipple, so that each flame will project into its tubular length of fuel and have action upon the tips B and also the open front C.

Automatic Gas-Valve.

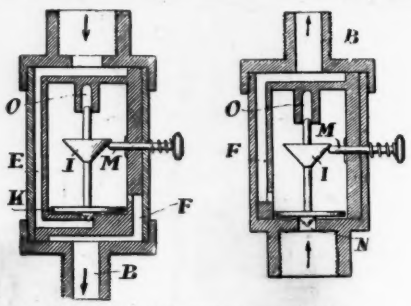
SCHLÖSSER, C., of Stuttgart, Germany.

No. 30,162; Dec. 24, 1909.

This automatic valve is of the type which comprises, in combination with the gas-main and the burner-tube, a channel connecting the valve casing with the burner-tube, a disc and a cone upon the lower surface of the disc for closing the inflow opening from the main and being so heavy that they cannot be lifted by the pressure, and a horizontal spring-controlled pin guided in the side wall of the casing and bearing with its inner end against the valve disc; this spring-controlled pin being operated to give the valve its initial opening movement.

The valve is shown connected with a suspended burner and in connection with an upright burner.

The valve consists of a disc K, which has upon its lower surface a cone to close the orifice of the gas-channel E. Upon the vertical rod fixed upon the disc is a cone I, and the upper end of the rod is guided in brackets O projecting from the upper wall of the casing. Upon the casing the burner-tube B is mounted and connected with it by the channel E. In the opposite side wall is a horizontal pin M, the inner end of which bears against the cone I; being maintained by a spring in such position that its inner end just touches the cone. The valve is of such a weight that the pressure of the inlet gas is not sufficient to lift it without an impulse communicated by hand or some other means. This impulse is given by pushing the pin M into the valve casing against the action of its spring, whereby the cone I is lifted and the valve-disc K is pulled upward, so that the pressure of the inflowing gas can maintain it in the lifted position. As soon as the pressure ceases, the valve-disc K drops and closes the inflow of gas by its cone G.



Schlosser's Automatic Burner Valve.

For the upright burner, the gas enters the valve casing through the channel N and flows out to the burner-tube B through the channel F.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Glasgow Meeting of the Institution of Gas Engineers.

SIR,—Will you kindly announce in your next issue that the date of the annual meeting of the Institution of Gas Engineers, which this year is to be held in Glasgow, under the presidency of Mr. Alexander Wilson, M.Inst.C.E., the Engineer and General Manager of the Corporation Gas Department, has been fixed for June 13 to 16.

39, *Victoria Street, S.W., Jan.* 14, 1911. W. T. DUNN, Secretary.

Mantle Testing.

SIR,—I have read, with considerable interest, the paper by Messrs. Coste and Powney, on the above subject, as well as your editorial remarks with regard to it.

I cannot help thinking that your criticisms, although in some respects warranted, are unnecessarily stringent, and to some extent contradictory. You start with an axiom as excellent as it is obvious, when you say, "The need is an uncomplicated test that can easily be applied and which will not absorb too much time." Yet you almost immediately take exception to the test conditions advocated by Messrs. Coste and Powney, because they do not reproduce exactly the conditions under which the domestic mantle has to exist. As the average life of the domestic mantle is anything from 500 to 1000 lighting hours, any test exactly reproducing these conditions must, of necessity, last that length of time. Obviously, therefore, any test that will fulfil the axiom you have enunciated must in some way or other accentuate the stresses that obtain in the normal life of the average mantle, and so reduce the time-factor.

The measure of the extent to which the time-factor is to be reduced must, of necessity, be the measure of the extent to which the stresses must be increased. It would appear that Messrs. Coste and Powney have unduly increased the speed and severity of the shocks, in their desire to reduce to a minimum the time taken in performing the test; and to that extent there is some justification for the exception you take to their method.

Tests of the strength of mantles can at the best be only comparative; and it is certainly desirable to standardize, as far as possible, both the machine and the method used, so that strictly comparable test conditions can be obtained. The shocks should be of such frequency and magnitude as to bring the time-factor within reasonable limits, but not so severe as to make it impossible to observe the various weaknesses of different mantles as they gradually develop under test.

In the testing machine designed by Mr. Moon and myself, it is possible to vary both speed and weights within considerable limits, and so produce a complete range of conditions, varying from an exceedingly gentle treatment to the severe conditions employed by Messrs. Coste and Powney. Every consignment of mantles received at Bournemouth is sampled and tested under exactly comparable and carefully determined conditions; and any falling off in quality is quickly detected.

It is found that weaknesses apparently inherent in certain makes of mantle develop gradually, and are easily observed. One make of mantle will almost always fail under test at the shoulder; another, at the loop; still another has a tendency to split up the side. What is more important, however, is that in our public lighting and maintenance work we find these special weaknesses exactly reproduced—thus proving the value of the test-machine, and to a great extent justifying us in relying upon the tests we obtain from it.

It is, of course, not possible to obtain results of mathematical accuracy. The best that can be obtained is the broad average data of say four to six mantles of any particular make or consignment. These are, however, always sufficiently well defined in their general characteristics to enable one to classify the consignment with certainty.

It would be interesting and profitable to hear the experience of other mantle-users, and what tests they make for their guidance. With so much depending at the present time upon the efficiency and the lasting properties of incandescent mantles, every gas engineer should be in a position to readily test the mantles supplied to him; and a testing machine, which, when carefully used, enables him to do this, and to obtain results which have a definite and consistent relationship to those

obtained in "actual life," deserves careful consideration, even if it is not the ideal and mathematically exact instrument he would like.

That strength and high illuminating effect are not always combined in the same mantle is, of course, well known; but this letter is already too long to justify me in making any further remarks on this part of the subject.

H. W. WOODALL, General Manager,
Jan. 14, 1911. Bournemouth Gas and Water Company.

[We are exceedingly glad to receive this communication from Mr. Woodall, and hope that it will be the means of stirring up a discussion on a subject that is of considerable importance. So much, as he remarks, depends on the efficiency and lasting properties of incandescent mantles, that we think it is high time some reasonable test of their main physical qualities was evolved (through discussion, investigation, and finally agreement between competent investigators) that could be accepted for common application. We are confident that if this were done, it would have a very important bearing upon mantle quality in the future. Such a result would serve one of the objects that we had in view in using Messrs. Coste and Powney's paper as an opportunity for raising the question. But now to the criticisms upon the editorial comments. One criticism is somewhat analogous to the shock mechanically applied to mantles; it is rather in excess of anything that was said in the article. Nowhere in the article did we take exception to the test conditions advocated by Messrs. Coste and Powney "because they do not reproduce *exactly* the conditions under which the domestic mantle has to exist." Reading the article carefully, it will be seen that throughout the objection taken is that the shock tests are *so much in excess* of anything that can be held to represent the normal use of mantles. In other words, that they are excessively severe and drastic through a test that compresses time, frequency of shocks, and vibrations (converting these into comparatively heavy shocks) into extraordinary narrow compass—into, in fact, tabloid form. When we view the consolidated form of the durability tests, and then look perspectively at the actual indoor life conditions of mantles, we must absolutely decline to subscribe to the dictum of our correspondent that "the measure of the extent to which the time-factor is to be reduced must of necessity be the measure of the extent to which the stresses must be increased." We will agree that the stresses must, owing to the time factor, somewhat accentuate the stresses of normal life; but they should not unduly do so. Stresses that are excessively increased in order to save time do not—this may be applied to human life and to any physical structure—represent the same thing as normal stresses spread over a considerable period; and our point is that there should be, in a reasonable test (perfection is not expected in this or anything else), some mitigation of the compression that obtains between an unduly stressful test and only a moderate accentuation of stress to compensate for the time-factor. Applying the dictum of our correspondent to Messrs. Coste and Powney's shock test (which is acknowledged by Mr. Woodall to be severe, and therefore points to the necessity in justice to mantles for some agreed standard test), Mr. Woodall admits a life of from 500 to 1000 lighting hours in domestic service. Take the lower figure, and suppose it represents only 100 days' life, the dictum means that the measure by which in a test this 100 days is reduced "must be the measure of the extent to which the stresses must be increased." Messrs. Coste and Powney apply 1000 shocks to a vertical mantle in between three or four minutes; and we should view with some interest their contention that this is merely a compression of the various resistances to continued life that a mantle meets with that is consistent with justice. It is hoped a discussion will ensue on this subject; for we repeat that it is, as Mr. Woodall says, one of considerable importance.—ED. J.G.L.]

Relative Effects of Gas and Electric Light on the Purity of Air.

SIR,—With reference to Mr. Hultman's query in the "JOURNAL" for Jan. 3, I may say that the original experiments were only undertaken for chemical purposes; and hence no records of temperature changes were taken specially. The temperature of the room was kept fairly constant throughout all the experiments by the use of a steam-radiator. We are, however, pursuing further investigations on the same question; and the point referred to by Mr. Hultman will probably be decided.

G. STANLEY COOPER.
Cleckheaton, Jan. 6, 1911.

Thefts from Gas-Meters.—At the London Sessions, before Mr. Robert Wallace, K.C., last week, two men pleaded guilty to being in the unlawful possession of three keys. One of these, it was said, had been especially cut in order to unlock penny-in-the-slot meters, and it would open half of those in the neighbourhood of Fulham.

The Claim for Back-Passage Lighting in Liverpool.—It was mentioned in the "JOURNAL" for the 29th of November last that an agreement had been come to between the Liverpool Corporation and the Gas Company with reference to a long-standing claim in respect of the lighting of back-passages in the city. It was originally for £5063; but under the agreement, the amount was reduced by nearly one-half. The estimates of the Tramways and Electricity Committee which will shortly be presented for approval include a sum of £3212, which is the agreed amount; and the Company have signified their willingness to accept it in three annual instalments. Consequently only £1071 will figure in the estimates when they come up for confirmation.

LEGAL INTELLIGENCE.

A COMPANY PROMOTER'S BANKRUPTCY.

Mr. E. O. Preston, trading under the style of E. O. Preston and Co., at 4, Tokenhouse Buildings, E.C., appeared for his public examination at the London Bankruptcy Court last Friday. He was represented by Mr. D. D. ROBERTSON; and the Trustee in bankruptcy and creditors by Mr. PATRICK HASTINGS.

Mr. PRESTON, in reply to the Assistant Official Receiver (Mr. Boyle), said he started the business of company promotion on his own account in 1888, having previously been partner in a firm of mortgage brokers. When he heard of any gas or water undertaking that might be developed, he formed a syndicate to take it over, and subsequently promoted a public company to which he sold it as an improved and going concern. The companies he sold to were in many cases not limited liability but statutory companies. His payments in respect of these promotions would be for services rendered in obtaining Acts of Parliament, completing the schemes, and then carrying out the whole of the works and handing them over. There was not always a syndicate formed; but when there was, it consisted of his own nominees, and his profits were those of the syndicate. It was about ten years ago when he first turned his attention to water and gas undertakings. The early transactions were not for taking over old concerns, as there were none existing, so far as water was concerned, and very few gas ones. It had been his idea to link-up villages in one comprehensive scheme during the past five years only. Originally his schemes were for supplies to towns and surrounding districts. He turned his attention to village supplies in the last five years because local authorities catered for the towns. He did not agree that the cost of linking-up villages prevented any possibility of profits, though the cost was very great. He appointed the directors of the companies in most cases. The construction contracts arranged by the syndicate or himself prior to the sale to the companies were sub-contracted for under estimates obtained by his own engineer. When subscriptions were asked from the public for the flotation of the companies, he had previously agreed with the companies to pay all expenses of obtaining the necessary Acts of Parliament, and also to procure subscriptions. He further agreed to take his profits as promoter in shares and debentures when cash was not available. In some cases these shares were given to directors to qualify them. In no case was he a director himself. When he commenced operations, subscriptions for shares were sufficient for him to take his profits in cash; but afterwards they were not, and he took debentures and in some cases shares. An amended statement of the bankrupt's affairs disclosed gross liabilities £58,871, of which £28,503 was expected to rank, against assets valued at £2970—showing a deficiency of £25,533.

The ASSISTANT OFFICIAL RECEIVER: I think it has often been the case, in the last five years, that where the subscriptions were sufficient to pay the promoters' profits, there was not enough working capital left to enable the company to carry on their works.

Mr. PRESTON said the whole of the works were carried out before the undertakings were handed over to the companies. Up to the year 1900, he was very successful, and was making a profit of £10,000 a year; and he was able to invest £25,000 in the purchase of freehold land and property. Things began to go wrong after the South African War, as the City was in a very unsettled state. After that he was not so successful. About this time, he founded the Finance and Construction Corporation, which was registered in Guernsey. He held a controlling interest in this concern, with 200 founders' shares, and took the whole of the profits, less 10 per cent. on the 200 ordinary shares. It was formed to carry on the business of E. O. Preston. It was wound up two years ago in Guernsey, and all the books had been destroyed. The reason it was wound up was that he had no further use for it, as any contracts entered into required to have his personal guarantee.

The ASSISTANT OFFICIAL RECEIVER: You had no further use for it because you saw the promotion of further companies was not going to be successful.

Mr. PRESTON said it was not that. The Company was started to carry out contracts, and after a time nothing could be done without a personal guarantee by himself. About the same time, he started the Water and Gas Securities Exchange as a medium for placing the shares and debentures of the companies he promoted.

The ASSISTANT OFFICIAL RECEIVER: I suggest again that you found it necessary to form this Company because the public were beginning to get shy of E. O. Preston.

Mr. PRESTON said it was not so. It was essential for him to keep the companies going at this time, as he had given personal guarantees to people who had subscribed for debentures and furnished materials required by the companies. The result of his promotions during the last five years was that he was £22,000 out of pocket. This represented money lent to the companies. At the end of January last year, he abandoned gas and water transactions, and turned his attention to promoting cinematograph and electric theatres. It was not a fact that none of the gas or water companies—some 22 in all—had ever paid a dividend. Some of them had reached a dividend-paying stage; but others had not been established long enough. He filed his petition in consequence of a judgment entered against him. He attributed his failure to his inability to obtain from various companies money lent to them, to liabilities incurred on behalf of the companies, and his failure to successfully float commercial undertakings.

The ASSISTANT OFFICIAL RECEIVER: Your liabilities at present are £51,028 in respect of these companies?

Mr. PRESTON: To the best of my knowledge, the unsecured creditors are about £25,000.

But there are not only unsecured creditors, there are other liabilities for £40,000 on behalf of companies?—Yes; but they hold securities.

The ASSISTANT OFFICIAL RECEIVER: Against these liabilities, you look to these companies to pay you £22,125. For the difference between these figures you have no remedy at all—it is all lost capital.

In answer to further questions, the debtor said the last balance-sheet he prepared was in 1905; and this showed a loss of £447. At that time, however, he had £18,000 to his credit in freehold property, quite unencumbered, at Cookham. It having been pointed out to him that one company had lodged a proof of debt against the estate for £18,000, and made a charge of misfeasance, the debtor said it was absolutely absurd. There were settlements on his wife in the form of life policies. There were five of these, of a total value of £16,000.

Mr. HASTINGS attempted to examine Mr. Preston as to the part he had played in the various promotions.

Mr. ROBERTSON, however, objected to the debtor being questioned except as to his own personal transactions.

The REGISTRAR (Mr. Brougham) repeatedly stopped Mr. Hastings, who at last sat down, remarking that it was useless to proceed.

Mr. WALTER MOORE, a creditor, then put a number of questions to Mr. Preston, the gist of which was that the debtor had induced him to take up £1000 of debentures by showing him an incorrect statement relative to a company; but the debtor denied the allegation.

The debtor was further cross-examined by Mr. Hastings as to the constitution of the Finance and Construction Corporation; and he stated that he was to take all the profits of that concern less 10 per cent. on the 200 £1 ordinary shares—about £20 a year. Counsel suggested that the debtor had bought works for the Bucks and Oxon Gas Company for £6000, and resold them for £29,000; but Mr. Preston explained that the latter price included three other concerns besides the one for which he paid £6000. He denied some allegations of a similar character in regard to other transactions.

Mr. ROBERTSON said he had no questions to ask, and the examination concluded.

Compensation for Poisoning by Coal Gas.

At last Saturday's sitting of the Leigh County Court, his Honour Judge Stangar awarded £300 compensation to Ellen Holt, whose husband died through inhaling coal-gas fumes while new high-pressure gas plant was being put in at the mill where he was employed as engine tenter. Messrs. Courtald and Co., of the Brook Silk-Mill, Leigh, in whose service the man was, did not dispute liability, and the only question for his Honour was the amount to be awarded. The circumstances of the case were reported in the "JOURNAL" for the 20th of December last (p. 866). Holt, after passing through the mill during the time the gas brackets and pendants were being changed, complained of having been "gassed;" and he died the same week. At the inquest, the medical evidence was to the effect that death was due to coal-gas poisoning. One doctor said, in reply to a juryman, that it was possible for two men to go where there was gas, and one to escape its effects and the other to be affected.

Unsuccessful Claim at Cardiff.

At the Cardiff County Court, an action was brought by James Stanmore against the Cardiff Gas Company, for the recovery of £50 damages in consequence of his gas supply being cut off. Plaintiff's statement was that he complained of the gas-meter put into his shop, and, because he would not allow the Company to take out his meter and fittings, they left him in the dark, so that he could not go on with his business. For the Company, it was pointed out that the plaintiff had gas supplied to him on the prepayment system; and the Company were not under any obligation. The plaintiff, they said, was never a satisfactory customer, although the Company put in three meters to try and suit him. When the meters were removed, they were found absolutely accurate, though the indicators invariably showed that more gas had passed through than had been paid for. On two or three occasions, shortages were paid for; and, finally, last October, following a shortage of 1s. 10d., the Company took up the position that there was no satisfaction in supplying gas to the plaintiff in this way, and gave notice in writing of their intention to take away the meter, and furnish a supply in the ordinary way. The Company gave him more than a week's notice to pay the gas bill; but he would not even allow the Company's men to take the money out of the meter, and, in order to maintain their rights, the gas was cut off. The Judge said the plaintiff had complained of the gas being cut off; but he seemed to forget that the automatic meter belonged to the Company, and could be removed in 24 hours. This was an unfortunate circumstance for any tenant; but the plaintiff himself signed the agreement which bound him. The plaintiff alleged against the Company a broken contract; but they had broken no contract, and the action must fail.

Price of Gas at Rhyl.—The Rhyl Urban District Council having refused to pass a resolution instructing the Gas Committee to consider the question of a reduction in the price of gas, the Ratepayers' Association have passed a resolution expressing regret at the decision, and hoping that the matter will again be raised at an early date. They also determined to ask the Council to consider the question of allowing a discount of 5 per cent. off all gas and electric lighting accounts paid within ten days of the delivery of the bills.

Sidmouth Gas Company's Bill.—A report by Messrs. Baker and Co., Parliamentary Agents, on the subject of the Bill which the Sidmouth Gas Company are promoting, was submitted to the last meeting of the Sidmouth Urban District Council. The Chairman (Mr. T. Kennet-Ware) said that if the Bill passed the Company's status would be greatly improved, and it would be extremely difficult for the Council to obtain any concessions. The Company would have a monopoly, and would be able to charge what they pleased for gas and electricity. He supposed the Council would not entertain the suggestion that they should purchase the Company's works. The Clerk stated that the District Councils Association would go through the Bill, and make a formal report upon it. They would be able to negotiate with the Company if they gave notice of opposition to the Bill; and if they obtained satisfaction, they might retire on the Company paying their costs. It was decided to refer the matter to the General Purposes Committee.

MISCELLANEOUS NEWS.

KIRKCALDY GAS-WORKS PURCHASE ARBITRATION.

PROCEEDINGS IN EDINBURGH.

Monday, Jan. 9.

The hearing of evidence in connection with the transfer of the Kirkcaldy Gas Company, Limited, was, as stated in the "JOURNAL" last week (p. 107), begun in Edinburgh on Monday, the 9th inst.

The Arbiters are: For the Company, Mr. CORBET WOODALL; and for the Corporation, Mr. ARTHUR SILVERTHORNE. They nominated Lord SHAW OF DUNFERMLINE as Oversman. Mr. NORMAN J. MACPHERSON, S.S.C., is Clerk to the Referee. The Company are represented by Mr. MURRAY, K.C., and Mr. MONCRIEFF (instructed by Messrs. Martin and Co., of London, and Messrs. Adamson, Gulland, and Stuart, of Edinburgh); and the Corporation by Mr. CLYDE, K.C., M.P., and Mr. MACMILLAN (instructed by Messrs. Morton, Smart, MacDonald, and Prosser, of Edinburgh).

Mr. MURRAY intimated that it had been agreed between them that the action in the Court of Session by the Corporation against the Company with reference to discount should be determined in this process. It had also been agreed that the transfer should be as at May 31, 1910. There were other questions which might arise, such as disbursements before and after this date, &c., which he would like also should be made matter of agreement, so that there should be no questions arising between them after the award. If these were not agreed upon, there might arise questions in the arbitration as to relevancy and jurisdiction, and as to what the undertaking was; and unless an agreement should be come to, it might be necessary for him to lead his evidence under protest.

Lord SHAW thought it would be highly inexpedient that, in a universal arbitration like this, they should begin with a protest. They would hear the evidence; and the matters might be arranged as they went on.

Mr. MURRAY acquiesced.

Mr. CLYDE considered that questions of relevancy could only be determined after the evidence was led. The matter of jurisdiction consisted of the answer to the question, What is the undertaking? This, he thought, they might ask the tribunal to settle; but he would be very glad to meet his friend.

Mr. MURRAY then formally, and, in the meantime, under reservation of questions of jurisdiction, called his first witness.

Mr. *William Cash* said he had examined the books and records of the Company, and put in tables, which had been acquiesced in by Messrs. Wood, Drew, and Co., of London. These covered the period from 1883, when the Company was incorporated under the Companies Acts, till Whitsunday, 1910. The Company started in 1829 with a capital of £4000. In 1845, this was increased to £6000. In 1863, there was a further issue of 100 shares, of £5 each, at a premium of £516 11s. The premium no doubt was applied for capital purposes. The next issue of capital was in 1865, when 50 shares of £5 each were issued, at a premium of £100 5s. This was similarly applied. In 1866, the capital was increased to £13,500. By this time, the surplus profit in the hands of the Company had increased to £6750, in part by re-valuation, which went to justify the Board in dividing the surplus among the shareholders—taking it from the surplus and adding it to capital. In the same year, there was an increase of 200 shares, upon which a premium of £232 5s. was received. There was no further increase of the capital till 1872, when there was another issue of shares, upon which £1052 1s. premium was received. In 1878, there was a further increase of £3000, in £10 shares, upon which there was a premium of £1672 13s. This premium was added to capital in 1883, when the capital was increased to £30,750. At this date, with £3870 of surplus funds, £2850 sinking fund, and £1857 from the gas reduction account, there was added to capital £10,250. For every two shares held by him, each shareholder received a third share. Since 1883, there had been added to capital £34,000, raising it in 1910 to £65,335. The sums standing at the reserve and depreciation funds the Company had treated as partners' capital, and had allowed interest at 7½ per cent. upon it before allocation to profit and loss account. The rate was a high one. It was no unusual thing for a gas company to use their reserves in the business, and, if they were so used, to add interest to the fund; but it was more usual to calculate the interest at about the rate obtainable outside. The Company also added to the fund interest on undivided profits. This was also unusual. But although this method of treating the accounts was unusual, it would have been the same if the Company had said they would have added the items to reserve. They had the power to do so. In view of the large sums written off, there was no doubt that £72,443, which was the total capital expenditure, had been laid out upon the Company's works and plant. In the case of meters, for instance, their cost to-day he made out at £14,800, which compared favourably with the £12,333 stated by the Company—showing that a reasonable allowance in the way of writing off had been made. In the case of gas-stoves, these were dealt in on the ten years' hire-purchase sum. Rent was charged, which was placed to purchase; and the Company depreciated the stoves to the amount of 10 per cent. They had treated themselves unfairly, in respect that they had written off more for depreciation than they received as rent. It was quite evident from the balance-sheets of the Company that they were adding to the reserve and depreciation funds out of profits. An attack had been made upon them in respect that they had been acting *ultra vires* in selling gas cheaply for heating and power purposes. If the Company had refused to afford the usual facilities given by gas companies at the present day, they would have been open to censure.

In cross-examination by Mr. CLYDE, witness said in 1910 the Company divided 8½ per cent. upon their total capital. Prior to this, they had never divided, under the name of dividend, more than 7½ per cent., subject to the reservation that other payments were made. The foundation of the regulation under which not more than 7½ per cent. was divided was the agreement of 1845. This agreement was entered into

because certain people came into the Company and said that the price of gas was too high, and that if the Company did not meet them they threatened opposition. The Company, in terms of this agreement, altered their constitution. Under the altered constitution they were limited to a dividend of 7½ per cent., and were allowed to lay aside 2½ per cent. as insurance, and 2½ per cent. more to a sinking fund, which was to accumulate to £1000. Any surplus over this was to be used in reducing the price of gas. The effect of the balance-sheets issued by the Company, upon the person who had not other means of knowing it, was to conceal that the Company were earning more than they were distributing. At the same time the Company could not conceal that their reserves were steadily growing. The Company would seek to conceal their profits as a commercial proposition—that it was advisable to build up a substantial reserve. They made it all capital in a year or two. They did not destroy all their reserve; they had £18,000 to-day.

Mr. CLYDE: Suppose it had been exhibited to the public of Kirkcaldy that since 1845 the Company had been deliberately evading their agreement to pay 7½ per cent.; that they paid dividend on stock issues on accumulated profits, on the gas reduction account even; and that they had taken good care not to disclose publicly what their profits were; would they in 1908 have maintained their position?

Witness: The Company might perfectly well have said they were quite entitled to what they had done, and that they were not charging more for gas than they were entitled to. The accounts as made out did not disclose the full profit for the year.

Re-examined by Mr. MURRAY: The history of the Company showed that they had been extremely strong and stable. He thought that the Company departed from the so-called agreement of 1845. In July, 1861, the Company, while agreeing to reduce the price of gas, declined to entertain other proposals with reference to photometric testing of the gas; and thus they repudiated the agreement of 1845. From 1897 at least, the Company had been free from any restriction, if they ever had any, with regard to the administration of their own finance.

By Lord SHAW: He regarded the Company as not only free-handed, but he also looked upon competition as a negligible quantity. He did not think that anybody would have embarked capital in an undertaking which was to be run in rivalry to an existing company.

Tuesday, Jan. 10.

When the proceedings were resumed this morning,

Mr. *Adam Macpherson* handed in a volume of correct excerpts from the minute books of the Company. He was, he said, in the service of the Company as Engineer and Manager for over 34 years. He was appointed in 1869, and retired in 1903. He was at present a Director and Chairman of the Company—having been appointed Chairman in 1910. The Company was originally formed to supply Kirkcaldy, Linktown, Bridgetown and Morningside, Newtown of Abbotshall, Pathhead, and Sinclairtown. Most of the villages and places named had, since the formation of the Company, been annexed to the burgh of Kirkcaldy. There was still an area outside the extended burgh of Kirkcaldy, consisting of a district which is now within the burgh of Dysart, and a small strip which is still in the county of Fife. In 1830, the site of the works was in Linktown. In 1845, certain representations were made by a provisional Committee, a *quasi* agreement was come to, and certain alleged restrictions were supposed to be placed upon the dividend-distributing power of the Company. The purport of the agreement (if agreement it was) was, of course, to restrict profits, and to apply the profits for the benefit of consumers by reduction of the price of gas. In point of fact, from beginning to end of the Company, the profits were applied in the reduction of the price of gas to the consumers; but none of the earned profits were ever distributed among the consumers. The profits were for a period at least, during the history of the Company, carried to the gas reduction account; and from time to time the price of gas varied. From 1830 onwards, the price had been very materially decreased. The reason for the formation of the gas reduction fund was that, if in any year they lowered the price of gas too much, they could draw upon the fund. The moneys which stood at the credit of the gas reduction account and the like belonged to the shareholders, to do with as they pleased; there was no restriction. In the period of his administration, he had regarded the limitation of dividend as purely a voluntary act on the part of the shareholders. In the Dunfermline arbitration, in 1896, he gave evidence in which he expressed the view that the limitation of dividend was purely voluntary. He never understood at all that the Company were restricted in any shape or form. The alleged arrangement of 1845 did not provide in terms for a gas reduction fund. From 1845 to the present day, with the exception of certain correspondence in 1861, the matter of the alleged agreement of 1845 had never come before the Company for consideration. They did not know anything about it until they referred to the old minute books in view of this arbitration. During his period of administration, the matter was never made the subject of complaint to him that the Company were in contravention of any alleged agreement; and so far as contract was concerned, he had made a search and had found that there was no contract embodying any such arrangement among the papers of the Company. In 1881, a supplementary contract of co-partnery was entered into, which contained no reference (at least in terms) to the arrangement of 1845. In 1845, what was apparently contemplated was payment of a dividend of 7½ per cent., and reservation of two additional sums of 2½ per cent. each. In 1861, this was converted or altered into payment to the shareholders both of the dividend of 7½ per cent. and of the 2½ per cent.; and the second 2½ per cent. was applied to the contingent fund, which was to be made up to £1000. In point of fact, the Company acted upon the view that they were entitled to, and they paid over to the shareholders not only the 7½ per cent., but the 2½ per cent., and treated the whole as dividend, and dividend which was paid free of income-tax. He submitted a table of dividends paid by the Company from 1831 to 1863. This showed that the dividends during this period varied from 2½ per cent. to 10 per cent.; the price of gas varying from 12s. per 1000 cubic feet in 1831 to 4s. 2d. in 1863. As early as 1848, the policy of adding interest on the reserved funds appeared—following, apparently, the example of the Greenock Company; so that from 1899 onwards the Company were just reverting to what was adopted at a very early period of their life. It was no new departure. It was not till after 1869 that the buildings and works of the Company were covered by insurance. Therefore, till then, when the Company paid the shareholders 2½ per cent., in the name of insurance, along with the dividend, the buildings were uncovered by insurance. In the Company's report of the annual meeting of 1866, the Directors reminded the shareholders of teir shares having been doubled without payment, and added that the fire insurance and interest accounts were abolished—the yearly dividend in future being intended to cover everything. From 1866 to 1883, although the interest payments were abolished, the Company still kept the sinking fund and the gas reduction fund; and it was from these two funds, *plus* surpluses of revaluation of assets, *plus* sums received as premiums, that the subsequent addition was made to capital. It had been suggested that there had been some devices adopted for the purpose of concealing from the public these additions of interest; but he found, in point of fact, that these additions were disclosed from time to time in the Directors' reports. In the year 1869, the report said: "Sinking Fund.—This fund has been credited with interest at the rate of 5 per cent. The fund has now at its credit £1476 13s. 4d." The original area of the burgh was about 200 acres. By the extension of the burgh, it was nearly 2000 acres. In 1883, the Company was registered, and the Articles of Association were arranged. In 1897, a report was obtained from Messrs. Lass, Wood, and Co., to the effect that the Company should issue a further £12,500 of share capital at par, take powers to raise the total share capital to £70,000 in 14,000 shares of £5 each, and cancel all restrictions as to limit of dividend, holding of shares, and reserve and depreciation funds. Consequent upon this report, £12,500 of capital was issued at par, and new Articles of Association were adopted. There was no foundation for the suggestion that what happened in 1897 was consequent upon, and was the result of, a mooted proposal by the town to buy up the Company. It was in consequence of Messrs. Lass Wood, and Co.'s report, and of their being advised that their assets were really of greater value, and that a considerable amount of over-expended capital had to be provided for, that these steps were taken. In 1897, they had about £11,000 of over-expended capital in their works. In 1898, the Corporation obtained an Electric Supply Order; and he thought the supply was started about October, 1902. Since then, so far as lighting was concerned, any monopoly which the Gas Company had had disappeared. In 1898, a change was made in the policy of the Company in regard to the matter of interest. This was done at his instance. He represented to the Secretary that he considered the shareholders were not receiving justice, because no interest was being allowed to them on their surplus funds. These funds were being used for the purposes of the Company in their business, and they were not being credited with interest. The consumers were getting the benefit of the accumulated profits, while the shareholders were not having anything. He retired in 1903, from ill-health. In consequence of a unanimous resolution, he was granted a pension, as to which a question was raised in the arbitration. His successor was Mr. Kincaid, who was still Manager. The Dysart area was first invaded by the Kirkcaldy Company's pipes a long time ago. The original Deed of Partnership contemplated operations in Pathhead and Sinclairtown, and also in Dysart. They laid pipes many years ago in the highway through Dysart. This was primarily for the purpose of supplying the public lamps; and it was done on the application of the Dysart Town Council. The rest of Dysart was supplied by a small private Company. There never had been any competition as to supply between the Kirkcaldy and the Dysart Companies. They had been repeatedly asked to go into Dysart, and had refused to do so. This had not been the result of any understanding between the Companies—it was simply friendliness. He thought the Dysart Company made about 9 million cubic feet of gas per annum, as against 148 millions in Kirkcaldy. In point of fact, there was nothing to prevent the Kirkcaldy Company, or their successors, from invading the area of the Dysart Company; and equally, if the Dysart Company were strong enough, there was nothing to prevent them invading the Kirkcaldy area. He did not think anything was to be apprehended from competition between them. The Dysart area supplied by the Kirkcaldy Company was for a time not very valuable; but it was becoming more so. The Dysart authorities had never demanded payment for way-leave. The Company paid the county authorities 1s. a year way-leave. With regard to the pipeage in the burgh of Kirkcaldy, from first to last they had never had any difficulty with the burgh authorities, either as to the laying of the pipes or their right to repair and maintain them. They were often requested by the town authorities to lay pipes in different places to suit them. As a Royal Burgh, Kirkcaldy had always had a Provost and a Town Council; but until 1876, the roads were under the management of a separate body—the Burgh Trustees. This body disappeared in 1876; and from that date the Police Commissioners and the Town Council had been the authoritative body. In 1830, on the application of the Committee of Management of the proposed Gas Company, the Magistrates unanimously granted permission to lay pipes underground, upon the express condition that the Company should keep up and leave such parts of the streets as they might open in good order and repair for twelve months. Witness spoke to several minutes passed by the Burgh Trustees and the Company upon the subject of the Company's right to lay pipes in the streets, and, in reply to the Oversman, said that what happened was that they were all very friendly in Kirkcaldy, but that, so far as minutes were concerned, and on paper, they were determined to be at arm's length. They had remained on paper at arm's length, and the question of the laying of pipes had never been raised. With regard to discount, which formed the subject of an action in the Court of Session, the town were to receive 25 per cent. off their account for the public lighting. This practice continued till two years ago, when the Company thought it judicious to issue a circular to private consumers, offering discounts varying from 5 to 17½ per cent. The Corporation were claiming, in the action in the Court of Session, 17½ per cent. in addition to the 25 per cent. The circular which had been addressed to the private consumers was sent to the town, he thought, because the town burned gas in other places—in halls, &c. Anyhow, the circular was sent, among others, to the Town Clerk. They took every meter as a consumer; and if any of the town's meters exceeded

250,000 cubic feet, they would be entitled to the discount. The town proposed to aggregate their consumption through different meters, in order to bring them up to the quantity to enable them to get the discount. The Company maintained that the town were entitled to 25 per cent. on the public lamps, and to nothing more, except they had a consumption of 250,000 cubic feet in any one meter. The Corporation passed the first resolution to adopt the Burghs Gas Supply Act on May 10, 1909; and it was not until after this that the question of discount was first raised.

Replying to the OVERSMAN, witness said that the Company, though the town were not entitled to it, offered, for the sake of peace, 10 per cent.; but the Corporation would not accept it.

[At this stage, an adjournment was made to allow the Oversman and the Arbiters, accompanied by Mr. Macpherson for the Company, and Mr. Herring for the Corporation, to visit the gas-works.]

Wednesday, Jan. 11.

On the resumption of the proceedings to-day,

Mr. MURRAY intimated that he and Mr. Clyde had had a talk upon the subject of discount. The Company offered to write-back into the account the 10 per cent. for the town's consumption other than in the public lamps; and the Corporation were to refrain from claiming 17½ per cent. upon public lighting. The town were to be treated as a single consumer. With regard to public lighting, the situation remained as before—the Corporation to get 25 per cent. discount.

The OVERSMAN: Then that is the Court of Session action completely finished by the good sense of the parties.

Mr. *Adam Macpherson*, resuming his evidence, said that the consumption of the Company's gas in the burgh of Dysart at the present time amounted to 401,000 cubic feet per annum, or 3 per cent. of the Company's consumption. Kirkcaldy might be taken as a growing place. At present the population was reckoned at 40,000—a growth of 6000 in nine years. In 1901, there were 7516 inhabited houses; in 1909, there 9129. There had been an increase in the length of roads from 28 to 35 miles. The number of consumers at May 31, 1910, was 8668. This showed an increase on the last ten years of 1305. At the same date, there were 120 new consumers waiting to be supplied with prepayment meters. Taking the undertaking as he knew it, he had no doubt that the business not only could be maintained, but might be largely increased. The gas-works were very well situated for the supply of the district—being at the lowest level of supply. They were in very good order and condition; and every part of the manufacturing apparatus had been enlarged and renewed within recent years. The works were quite modern; and their capacity was considerably in excess of present requirements. The carbonizing plant consisted of two separate benches, on the regenerative principle. There were 104 retorts in all, in thirteen ovens, each oven containing eight retorts. To produce the maximum quantity of gas required at present, there were 72 retorts at work. Each retort produced 9833 cubic feet of gas in 24 hours, which was a very good yield. The 104 retorts were capable of producing 1,020,000 cubic feet in 24 hours. The present maximum production per 24 hours was 735,000 cubic feet, which showed a surplus capacity of 160,000 cubic feet per day.

By Mr. CORBET WOODALL: The average make of the maximum week's production ran out at 661,000 cubic feet per day.

Witness, in further examination, said this showed that the carbonizing plant was 35 per cent. in excess of present requirements, over and above the usual margin of 12½ per cent. for safety. The condensing plant was sufficient for 1,200,000 cubic feet per day, which was 465,000 cubic feet in excess of present maximum requirements. There was a tar-extractor, of a capacity of a million cubic feet per day, which was about 260,000 cubic feet, or 33 per cent., in excess. There were two exhausters, one of a capacity of 1½ million cubic feet, and the other of 2 million cubic feet per day. The smaller one was able to deal with double the present maximum requirements. The washing and scrubbing plant was equal to 1⅛ million cubic feet per day. The purifiers were four in number, each 21 feet by 20 feet by 5 feet—of ample capacity for 900,000 cubic feet per day. The station meter (80,000 cubic feet per hour) was equal to more than double the present maximum make. They had an area conveniently situated for extension of the works—about 50 per cent. of the site. The gasholders were four in number—three being in the works, and one at Pathhead. The capacity of the four was 584,000 cubic feet; being fully 80 per cent. of the make in the maximum week. In point of working, the gasholder plant was sufficient. At the present time, owing to the unfortunate illness of the Manager, he had been in charge of the works at the very worst season of the year, and had found the gasholders more than ample in capacity. Taken generally, the mains, as laid, were more than sufficient and ample for the works. Witness put in a table showing pressures at different points. Broadly speaking, the pressure of the day-load at the works was 14-10ths to 15-10ths because they were very low. When the daylight was beginning to disappear, they increased the pressure to 30-10ths. In his opinion, 30-10ths, which was maintained at the time of greatest load, was more than ample to provide a proper and sufficient pressure at all parts of the system; and it could be increased to 40-10ths if desired. The unaccounted-for gas in 1909 was 14·3 per cent.; in 1908, 13·7 per cent.; in 1907, 15·1 per cent.; in 1906, 16 per cent. The length of mains was 37½ miles. They had 231 consumers per mile of main, who consumed 3,332,000 cubic feet of gas per annum. Their annual loss per mile was 559,000 cubic feet. The Commercial Gas Company had 341 consumers per mile, with a consumption of 11,108,000 cubic feet; and their loss per mile was 732,297 cubic feet. Yet, while in Kirkcaldy the percentage of unaccounted-for gas was 14·3 per cent., the Commercial Company's was only 6·1 per cent. In forming a comparison between the price of gas in Kirkcaldy and elsewhere, such matters as the quality of the gas, the price of coal, the value of residuals, capital charges, and the like, had to be taken into account. He had prepared and submitted a table showing a comparison with a few other towns. In this table, he had taken into account the net price of coal, the amount received from residuals, and the capital charges per 1000 cubic feet of gas; and the table showed that, when they took these considerations into account, the Kirkcaldy price compared favourably. If Kirkcaldy were similarly situated to the other towns, the price would be lower than theirs. The manufacture and disposal of residuals was an important consideration. Frequently the manufacture of sulphate of ammonia was a concomitant of gas-works; but they had not this advantage in Kirkcaldy. It would be an advantage; and the Directors had made up their minds to introduce it, when they got notice of the Corporation's proposal to purchase. Hitherto they had been afraid to do so, in case of nuisance; but apparatus had been so improved that they were intending to introduce it. In his view, the business of the Company was progressive. There had been in the last eight years an increase in the quantity of gas made of 16 million cubic feet. The Company had had to face electric light competition; but they had survived the competition, and were progressing still. There was an increase of 2¼ million cubic feet down to Dec. 31 last. He calculated the loss to the Company owing to the competition with electricity at, roughly, 10 or 11 million cubic feet a year. Taking everything into consideration, he thought it reasonable to say the worst of electric light competition was over, and that it would not be a serious rival in future.

Cross-examined by Mr. CLYDE: The restriction of dividend to 7½ per cent. referred to in the alleged agreement of 1845, was removable at the will of the Company. Mr. Kincaid, the present Manager, submitted a report on the works, dated in 1906, in which he expressed strong opinions with regard to the necessity for capital expenditure, and the expediency of getting out of the site they were in. The Directors handed him Mr. Kincaid's report; and he scrawled some notes upon it. Mr. Herring was then called in. Mr. Kincaid allowed his purifiers to get out of order; and he went, with the consent of the Secretary, to consult Mr. Herring about this. When Mr. Herring was there, he came in contact with the Secretary. He disagreed altogether with Mr. Kincaid's statement in his report that "the existing site is altogether too cramped to produce even the present output of gas economically, and the gasholder capacity much too limited to ensure regular working and a safe supply." Mr. Herring's opinion that they could not continue to satisfactorily and economically purify the gas without adding to the present plant, was altogether premature. He never heard till this moment that the Kirkcaldy Corporation kept a record of pressure at the Police Buildings. He had urged for years that there should be more pressure; and since Mr. Kincaid became ill, he had ordered more pressure to be put on. He had not the power to do so before. Since the introduction of incandescent gas lighting, a higher pressure was demanded.

Re-examined by Mr. MURRAY: The result of the working since 1907 had falsified the views expressed in Mr. Kincaid's report, and Mr. Herring's, and had confirmed, in all respects, his report of 1906.

Thursday, Jan. 12.

Mr. *Adam Macpherson* continued his evidence this morning. In re-examination by Mr. MURRAY, he said the constructional arrangements admitted of economical working on the present site; and if extension were desired, there was abundance of land for the purpose. If economies could be effected in working, these would all go to increasing the maintainable profit. It was absurd to say the position of the Company was critical. This did not harmonize with the actual working. The yield of gas in Kirkcaldy was 9691 cubic feet per ton of coal carbonized. With the exception of Edinburgh, Glasgow, and Paisley, the production was higher and better in Kirkcaldy than in any other town in Scotland. The average illuminating power, taken from observations made between August, 1909, and October, 1910, was 21·71 candles. With the exception of Kilmarnock, this was higher than the candle power of any other Corporation in Scotland. The net price received for gas was 36·13d., without giving effect to the discount of 25 per cent. for public lighting.

Replying to the OVERSMAN, witness said he considered that, with the surplus power of 160,000 cubic feet per day, the works would go on for seven or eight years without any addition. He totally disapproved of Mr. Herring's suggested reconstruction. He did not see that any capital expenditure would be required for a number of years.

The OVERSMAN: It is fair to Mr. Herring to say that his view of the necessity for increased plant was upon the footing which he put forward—that the pressure should be increased.

Witness said that was so. In view of the pressure being increased, as he had done this winter, he still thought that his margin of 160,000 cubic feet per day would be sufficient to last for six years.

By Mr. CORBET WOODALL: At the end of six years, he would use carburetted water-gas plant. He would not propose to remove the works, but would extend on the present site.

Mr. *Henry W. Woodall*, examined by Mr. MURRAY, said he visited the gas-works at Kirkcaldy in September of last year.

The OVERSMAN pointed out that the witness was a member of the firm of which one of the tribunal was a partner. It was most proper that this should have been stated at once. Had the parties any objection?

Mr. CLYDE had no objection, provided there had been no communication of figures or views between the arbiter and the witness.

Witness said he had not discussed the question with his father in any way. He thought the undertaking was quite equal to coping with the increased demand that was anticipated. He expected to find the works crowded, and the various portions difficult of access from other parts; but he was surprised to find the works in very good condition, well paved, and with plenty of room for every operation they could be called upon to perform. He had satisfied himself that there had been a capital expenditure on the works of £72,000. He made a structural valuation of the whole, and brought it out at £103,825, exclusive of the outlay on cookers. Taking 200 per cent. of the dividend of 7½ per cent., that, at 3¾ per cent., was equal to 26⅔ years' purchase. Allowing 10 per cent. on this, and making other additions, he brought out a price of £218,020. On the basis of the award in the Dunfermline arbitration, the presumed award in this case would be £196,375, to which would require to be added outside property and liquid assets, giving a total of £215,819.

By the OVERSMAN: The point between the parties was the difference between a 3¾ per cent. and a 5 per cent. yield.

The inquiry was then adjourned to Friday next, in Edinburgh.

SULPHATE OF AMMONIA MARKET.

Messrs. Bradbury and Hirsch's Review for the Past Year.

We have received from Messrs. Bradbury and Hirsch, of Liverpool, a copy of their "Review of the Market for Sulphate of Ammonia during 1910;" and, as on previous similar occasions, we extract from it the portions which chiefly interest our readers.

The "Review" opens with the gratifying statement that, in point of bulk, the fertilizer trade last year easily beat all previous records; but in the matter of profit, much more could have been desired in some departments. The condition of the world's trade has, on the whole, been expanding; and this fact, combined with the high prices ruling for cereals, beet, cotton, &c., during the sowing and planting season, no doubt afforded ample inducement to extend areas and to fertilize on a liberal scale. Owing to the decline in the prices of sugar and cereals, the prospects are hardly so favourable to-day as they were a year ago. But the world's requirements are constantly expanding; and, though an increase in demand for fertilizers such as was experienced in 1910 cannot be looked for this year, Messrs. Bradbury and Hirsch think they can at least count upon the 1910 demand being sustained.

At the end of 1909, unrestricted production of nitrate of soda had been going on for nine months; and, notwithstanding that efforts had from time to time been made to form a fresh combination of producers, it did not appear likely that anything in this direction could be achieved in time to materially affect the supply for Europe over the ensuing four months. Messrs. Bradbury and Hirsch thought they were justified in assuming that there would be no combination in the then near future; and they framed their estimate of supply for the United Kingdom and the Continent for January to April on this assumption. The actual supply proved to be 1,135,000 tons: Deliveries from the United Kingdom and Continental ports, 1,007,000 tons; and stocks at these ports brought forward into May, 128,000 tons. The estimate was 1,118,000 tons; and therefore it was 17,000 tons under the mark. But the circumstances at the time made a more exact estimate impossible.

The market was slow in January, and there was a decline in values from 9s. 3d. to 9s. 1½d. per cwt. Even in February, by which time, owing to favourable weather, the season's demand was in full swing, all that was achieved was a recovery to 9s. 3d. per cwt.; holders being rendered uneasy by what was still thought to be a too abundant supply. In March, however, after the February figures were published, and when it was seen that the unprecedented demand which had been experienced all through February was being sustained, there was a sharp advance, and 9s. 10½d. per cwt. was the price at the close of the month. But in April, though stocks at the ports at the end of March had been reduced far below those at the end of March in 1909, and though deliveries continued to be exceptionally heavy, there was a gradual decline in prices until 9s. 6d. per cwt. was reached. In May and June, the price alternated between 9s. 6d. and 9s. 4½d. per cwt., though from the point of view of available supplies at the ports the decline did not seem to be justified. Under other circumstances, a demand such as was experienced through February, March, and April would have brought about a big advance; but holders, under the influence of the nightmare of unrestricted production, seemed to be more concerned to convert their stocks into money than to attempt to manipulate the market. With but slight fluctuations, the price was 9s. 3d. per cwt. all through July; but in August, the statistical position having improved, there was an advance to 9s. 4½d. per cwt. During the subsequent months, there was no further improvement until the second half of December, when the price became 9s. 6d. per cwt. There has not recently been any special feature in the market; buyers having apparently satisfied themselves that supplies would be ample and that there was no occasion for anticipating their requirements.

The visible supply (stock and afloat) for the United Kingdom and the Continent at the end of 1910 was about 946,000 tons, compared with 1,007,000 tons at the close of 1909, and 923,000 tons on Dec. 31, 1908. The visible supply is thus 61,000 tons less now than it was at the end of 1909. On the other hand, stocks on the west coast are probably 85,000 tons more; and some account must be taken of this in estimating the probable actual supply for the United Kingdom and the Continent for the next four months. Messrs. Bradbury and Hirsch do not, however, see that there is much in present west coast prices to induce any special effort on the part of producers to reduce stocks; and, having regard to increased requirements in the United States and other countries, they say it would be too much to assume that the sole destination would be the United Kingdom and the Continent, even if the whole, or any large portion, of the extra stock should be shipped early in the present year. They think that advanced prices in Europe and America and much keener buying on the west coast would alone induce abnormal shipments; and there would then remain the question of freight arrangements, which cannot be made in a day or a week. On the whole, they are of opinion that the prospective supply of nitrate of soda will find a sufficient market, and at hardening prices if the season again opens early, and if weather conditions prove favourable. The production for the past year is estimated at 2,416,000 tons—an increase of 351,000 tons upon that for 1909; and of this increase, the United States have taken about 115,000 tons.

Dealing next with sulphate of ammonia, Messrs. Bradbury and Hirsch remind their readers that, when discussing the situation and market prospects a year ago, they expressed the opinion that, notwithstanding the abundant supply and relative cheapness of nitrate of soda, and the increased output of sulphate of ammonia in Germany and the United Kingdom, the demand for sulphate would be sufficient to absorb the supply over the spring months at the then level of prices, but that it would be imprudent to attempt to force an advance; supply and probable demand being, as far as could be seen, too nearly balanced. From the reservation of their own market in the preceding months, and from their offering more freely in foreign markets than they had done over the same period in other years, it was obvious that, in the opinion of German producers, their output had augmented more rapidly than their home consumption would increase. Not only, then, was the Continent not likely to be a promising outlet for British production, but Germany had to be regarded as a more serious factor in the export trade. They thought, however, that other and sufficient outlets would be found; and, in particular, they specified the United States and Japan. In order that their friends may be able to trace the direction of shipments abroad, they insert their usual four tables of exports, showing the shipments from January to March, April, June, and December respectively. From the last we take the following figures for the years 1909 and 1910, which show that the authors' expectations in regard to the United States and Japan were fully justified.

	Year 1910. Tons.		Year 1909. Tons.
France, Germany, and Belgium	15,945	..	49,142
Spain and Portugal, Italy, and the Canaries	67,116	..	72,512
Holland, Java, British Guiana, West Indies, and the Mauritius	54,589	..	49,157
Japan	57,360	..	49,275
United States	76,111	..	35,080
Other countries	12,651	..	8,875
Total	283,772	..	264,041

Coming to the price of sulphate of ammonia during the past year, Messrs. Bradbury and Hirsch report that from £11 7s. 6d. per ton f.o.b. Hull at the outset it had advanced to £11 12s. 6d. by the end of January, to £12 by the end of February, and to £12 5s. by the end of March; the total exports having increased 8382 tons in the meantime. In April, however, there was a set-back to £12 per ton; there being no material increase in the shipments during the month. By the end of May, the price was down to £11 16s. 3d.—there being an actual shrinkage in shipments; and the closing price in June was £11 15s., though there was an increase in shipments of 2495 tons in that month compared with those for June, 1909. The average price for the six months was £11 17s. 5d. per ton, or 9s. 11d. above the opening price in January. This was due entirely to the extraordinary demand for Japan and the United States, to which reference has already been made. There was nothing out of the ordinary, for the time of year, in the home demand; there being no inducement to a larger use of sulphate of ammonia, seeing that the average price for the six months was about 11s. per ton above the level of that for January to June, 1909, while the average price of nitrate of soda was about 12s. 6d. per ton below that for the corresponding period of that year.

There was nothing particular about the export figures in July or August; but in the latter month there was a sharp advance in prices—to £12 5s. per ton—occasioned by keen demand both for prompt and September delivery. Supplies were, in fact, bought and carried over to meet September requirementts, which were exceptionally large; being 5789 tons more than those for the corresponding month of 1909. At the end of September, the price was up to £12 12s. 6d. per ton. All through October, the demand was particularly keen, notwithstanding steadily advancing prices; and £13 per ton was realized before the close of the month. In the second half of November, however, there was a decline to £12 12s. 6d. per ton; and in the third week in December, as low as £12 11s. 3d. was accepted. But there was a sharp recovery; and at the close, £12 16s. 3d. was the price f.o.b. Hull.

The average price f.o.b. Hull for the six months from January to June was £11 17s. 5d. per ton, or 11s. per ton higher than that for the corresponding period in 1909. The average price for July to December works out to £12 8s. 10d. per ton, or 25s. 3d. per ton above the average for the second half of 1909. The average for the whole year was £12 3s. 2d. per ton, or 18s. 2d. per ton more than the average price in 1909. Having regard to all the circumstances of the case, Messrs. Bradbury and Hirsch think that producers have every reason to be satisfied with the year's working. All through they have freely placed their output on the market; and they have not at any time been hampered by more than just working stocks.

The actual production of sulphate of ammonia in Germany in 1909 proved to be 330,000 tons, or 10,000 tons less than was estimated twelve months ago. The estimate for 1910 is 375,000 tons; and, if it should turn out to be approximately correct, Germany has become the largest producer. Production in Belgium has been 38,000 tons, and that in France 56,000 tons—a slight increase in each case upon 1909. The output in Austria has probably been about 100,000 tons; and that in other countries in Europe has no doubt increased somewhat, but no details are obtainable. The 1910 production in the United States is estimated at 116,000 tons—an increase of only 10,000 tons upon that in 1909. In the United Kingdom, there has been an increase of something over 20,000 tons; and it has been mainly from carbonizing works, as was anticipated—the increase from other sources being scarcely up to normal. The world's output is, therefore, now approximately 1,100,000 tons, or less than half as much as the total output of nitrate of soda.

The production of ammonia, calculated into sulphate (including that used in the manufacture of ammonia soda and for other chemical purposes), from all sources in the United Kingdom in 1910 is estimated at 369,000 tons, apportioned as follows:—

	Tons.
Gas-works	168,000
Iron ,,	21,000
Shale ,,	60,000
Coke and carbonizing works and producer gas	120,000
	369,000

Of this production, Messrs. Bradbury and Hirsch reckon that England contributed 248,500 tons; Scotland, 117,500 tons; and Ireland, 3000 tons. The production (in tons) during the previous five years was as follows:—

	1909.		1908.		1907.		1906.		1905.
Gas-works	164,000	..	165,000	..	165,500	..	157,000	..	156,000
Iron ,,	20,000	..	18,000	..	21,000	..	21,000	..	20,000
Shale ,,	57,000	..	53,500	..	51,000	..	48,500	..	46,000
Coke and carbonizing and producer gas	107,500	..	85,000	..	75,500	..	62,500	..	46,500
Totals	348,500	..	321,500	..	313,000	..	289,000	..	268,500

Their estimate of the production in the United Kingdom in 1909

from carbonizing works was under the mark to the extent of their over-estimate in regard to gas-works; but in the matter of the total output from all sources, they were right to within 1000 tons of the actual returns. Their estimates of the home consumption during 1909 and of stocks to bring forward into 1910 would therefore be nearly correct. Assuming that stocks amounted to 14,000 tons, and that their estimate of production during 1910 is correct, the account for 1910 will stand as follows:—

	Tons.
Stocks brought forward from 1909	14,000
Production during 1910	369,000
	383,000
Exports during 1910	284,000
Home consumption (for all purposes) in 1910	87,000
Stock to carry forward into 1911	12,000
	383,000

Reviewing the position generally, Messrs. Bradbury and Hirsch say: We have already described the attitude of the German producers towards the market during the first half of the past year; and we have now to say that this attitude has not since changed. So well have they guarded their own market, that shipments from the United Kingdom, July to December, have shrunk from 14,455 tons in 1909 to 1368 tons in 1910. At the same time, German exports have been substantially larger than were those in the second half of 1909; but they have not been on anything like the scale of those in the first half of the year. Having regard, however, to increased production, we think that stocks in the hands of German producers are at least as large as were those at the end of 1909. There will be a further increase in production in 1911; but it will probably be very considerably less than the increase in 1910. It is more likely to be from 25,000 to 30,000 tons for the year. There is therefore nothing to hope for in Continental demand over the coming season; but the United Kingdom market may comfort itself with the reflection that, there having been a drop from 30,169 tons in January to June, 1909, to 10,449 tons in January to June, 1910, the back of the fall has already been broken. There may be an increase in the output in the United Kingdom over the next six months of 6000 or 8000 tons—again mainly from carbonizing works. In the United States, there will be a larger increase than there was in 1910; but, as the entire production seems to be readily absorbed on the home market, we do not see that the increase need cause any alarm. If, then, a moderate increase in production in the United Kingdom over the next six months may be expected, if a considerable increase over the same period must be counted upon in Germany, and some increase in the United States, what are the prospects of the market in view of it and in view of the relatively low price of nitrate of soda? If it is true, as we have elsewhere endeavoured to show, that there could not have been any increase, or at all events any material increase, in home consumption in Germany over the first six months in 1910, we do not see on what grounds any important increase is to be expected over the first six months in 1911. If relative cheapness caused an enormous increase in the consumption of nitrate of soda from January to June, 1910, while there was no appreciable increase in the consumption of sulphate of ammonia, it has to be pointed out that nitrate is relatively still cheaper to-day.

With regard to Japan, Messrs. Bradbury and Hirsch remark that the situation there in recent months has been rather puzzling. There has been a notable falling off in shipments since September, and without any apparent reason, so far as the agriculture of the country is concerned. There has been a slight increase in the imports of nitrate of soda. But it has not been material; and there has been no reversion to a larger use of bean-cake or other nitrogenous fertilizers. It is, however, reported that the crop of beans has been largely held in the country for higher prices than have been obtainable, and that the consequent financial stringency has caused the recent falling-off in demand for sulphate of ammonia. If the report is correct—and the authors have reason to believe that it is—they think it augurs well and not badly for the coming months. Such a speculative move can, of course, be followed for a time; but it cannot be followed indefinitely in a country like Japan, where the money is wanted badly for other purposes. They therefore consider that there will presently be a realization of the bean crop, and that the shortage in shipments of sulphate of ammonia since September will be compensated for by heavier ones over the spring months. They are confident that sulphate of ammonia as a fertilizer is going to stay in Japan.

Turning to the United States, Messrs. Bradbury and Hirsch say it is not generally realized that, without Alaska, they are nearly twelve times as large as Germany, and more than twenty times as large as the United Kingdom. Land has, in fact, been so plentiful that very little attempt has been made, except in the Eastern States, to cultivate it on the scale common in all the advanced countries in Europe; and, in proportion to the area, the quantity of fertilizers used has been but a fraction of that which has been employed in the United Kingdom, Germany, and France, though much progress has been made in recent years. It has now been realized that the yield per acre has not been half what it might be, and that it pays to fertilize. Hence the rapidly increasing demand for nitrate of soda, sulphate of ammonia, and all kinds of nitrogenous fertilizers. The demand for sulphate in recent months is stated to have been so large that it may perhaps be doubted whether it can be altogether sustained over the coming spring months; but, even if there is some slowing-down, it is thought that there is every reason for believing that the demand will be on a larger scale than it was over the corresponding months of last year. There is, moreover, in the inflated price of cotton, brought about by short crops, a special inducement to fertilize on a more liberal scale and over a larger area in the coming season; and it is pointed out that the bulk of the increased shipments of sulphate of ammonia from the United Kingdom has been to the Southern States, for the purposes of cotton growing.

Summing up the position, Messrs. Bradbury and Hirsch say that, notwithstanding the relative dearness of sulphate of ammonia compared with nitrate of soda, and any further shrinkage in Continental demand upon the supply from the United Kingdom, they are inclined to the view that the world's requirements will be large enough to absorb the world's output, and at the same time to sustain prices at fully the present level over the spring months. They do not venture any opinion as to what may happen farther ahead.

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 1, sulphate was £11 7s. 6d., and nitrate £9 5s. per ton; on April 2, the prices were £12 3s. 9d. and £9 15s.; at Midsummer, they were £11 15s. and £9 7s. 6d.; at Michaelmas, they were £12 12s. 6d. and £9 7s. 6d.; while at the close of the year, they were £12 16s. 3d. and £9 10s. respectively. The second table shows the average prices per cwt. of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1901, 8s. 11½d.; 1902, 9s. 4d.; 1903, 9s. 6½d.; 1904, 10s. 2½d.; 1905, 10s. 9½d.; 1906, 11s. 4d.; 1907, 11s. 2d.; 1908, 10s. 2½d.; 1909, 9s. 9d.; and 1910, 9s. 4½d. The third table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 44 years—1867 to 1910. The following are the averages for the past ten years: 1901, £10 11s. 4d.; 1902, £11 16s. 3d.; 1903, £12 9s. 2d.; 1904, £12 3s. 8d.; 1905, £12 10s. 9d.; 1906, £12 0s. 9d.; 1907, £11 15s. 8d.; 1908, £11 12s.; 1909, £11 5s.; and 1910, £12 3s. 2d.

GAS WORKERS' STRIKES.

Labour War at Lisbon.

As readers of the daily papers are aware, serious trouble was caused in Lisbon last week by a strike of the men employed on the railways. Scarcely had this disturbance been dealt with than the gas workers followed the example of the other branch of labour. According to the special correspondent of the "Matin" at Lisbon, as quoted by the "Daily Telegraph" yesterday, operations ceased at the gas-works on Friday night; and, "in spite of the presence of a detachment of the Republican Guard and of firemen, who had been brought to ensure its normal progress, 20 out of 35 furnaces were damaged. Finally, after a good deal of hesitation, the strikers who were continuing their malpractices were evicted; 260 men being needed for the expulsion of the sixty *saboteurs*. Since then the firemen and a new staff have replaced the strikers, and the works present a picturesque aspect, as the firemen, with their helmets on, are busy at the furnaces." The writer adds that, by way of precaution against violence being attempted by the strikers, troops are posted near railway stations and gas-works. The railway men's strike terminated on Saturday; but that of the gas workmen continued, and the employees at the electric light works joined them. The Civil Governor of Lisbon issued an edict requesting the inhabitants to restrict their consumption of gas as far as possible, as the strikers had damaged the gasholder at Belem. He added that by Tuesday a normal state of things was likely to be restored. At noon on Sunday, the train services on certain lines were working normally; and the striking gas workers were being watched by troops. At daybreak, it was found that what was regarded as an excessive consumption of gas by the town was due to leakage in the principal main. An investigation showed that the damage had been caused by the strikers in an endeavour to cut off the gas supply to the suburbs of Lisbon. The local Republican Committee are assisting in the work of restoring the lighting service. At four o'clock on Sunday morning the supply of gas was exhausted.

A Short Strike at Sydney.

In consequence of the refusal of the Directors of the Australian Gaslight Company to reinstate a dismissed employee who is Secretary of the local Union, about 1200 men struck work on Thursday last. A conference took place between the executive of the Union and the Premier, which resulted in an agreement; and the men resumed work on Friday night. The terms of the agreement are that the dismissed man shall be suspended during an inquiry by a Board composed of three employers and three workmen, with Mr. Watson, the former Premier, as Chairman. If he is found guilty, he will be employed in a reduced position; but if innocent, he will be reinstated.

Failure of Gas Supply at Lisburn.—Between half-past nine and ten o'clock on the night of the 7th inst., when business in Lisburn was in full swing, the gas supply was suddenly cut off, and considerable inconvenience was caused in the shops depending upon it for light. The defect was, however, at once attended to at the works, and the supply restored.

Workhouse Lighting Question at Hastings.—Some weeks ago, the Hastings and St. Leonards Ratepayers' Association addressed the Local Government Board on the subject of the proposed lighting of the Hastings Workhouse by electricity instead of gas, and urged that the application for the Board's sanction should not be granted till full information had been given them. At the last meeting of the Guardians, a letter was received from the Board enclosing the one sent by the Association; but no comment was made upon the communication. According to a report of the Borough Electrical Engineer, 1166 yards of main and a transformer kiosk near the gates of the Workhouse will be required for the lighting; and he estimates the cost of the main at £350 and of the kiosk at £30.

Gas-Meter Robberies by Children.—In the Children's Court at Exmouth, on Monday last week, three boys and a girl were charged, on remand, with breaking into several boathouses, and stealing sums of money, amounting to £2 14s., belonging to the Exmouth Gas Company. They admitted taking money from the meters; and a constable stated that since the previous hearing it had been ascertained that £5 10s. had been stolen. It was stated that two of the accused were charged in June, 1909, with stealing, and were bound over, under probation, in £5, for six months. The Bench now sentenced each of them to three years in a reformatory; the parents to contribute 1s. each per week for their maintenance. The other lad, who was over sixteen, was sentenced to four months' imprisonment, with hard labour.

DARLINGTON GAS UNDERTAKING.

Suggested Extensions.

The following report on some proposed extensions at the Darlington Gas-Works, which was submitted by Mr. Frank P. Tarratt, the Engineer and Manager, to the Gas Committee, has been laid before the Town Council, when the matter was referred to a Sub-Committee.

In view of the steady increase in the quantity of gas sent out from these works since March last, I feel it my duty to again call your urgent attention to the necessity for proceeding with the extensions to our manufacturing plant.

Our existing plant is now working to its utmost capacity during the winter months; and this season we have had every retort in operation in each of the retort-houses. So should the present rate of increase in our daily output of gas continue, we shall soon have great difficulty in coping with the demands made upon us.

The quantity of gas made during the eight months ending November, 1910, shows an increase over the corresponding period of last year amounting to 16,219,000 cubic feet, equal to 7·41 per cent.; and as there is every prospect of Darlington fast becoming a great industrial centre, with the inevitable result that the quantity of gas required will steadily increase, we must of necessity make provision for same.

Already this year we have fixed nearly 400 additional automatic meters; and we have been fixing over 400 per annum for the past seven years.

We should even at the heaviest season of the year have a margin of 25 per cent. of our retorts available; so that they could be brought into use should any of our settings fail us through any cause, which is not at all an unlikely thing to happen, when you consider the high temperature that obtains in the retorts, and the length of time some portions of the benches, &c., have been in almost constant use. If we had a reasonable margin of retorts available, it would enable us to carry out the necessary annual repairs with greater ease than is at present possible, as the settings are no sooner cold at the end of the winter season than we are compelled to hurriedly repair or reset the furnaces and settings—working overtime throughout the summer months to ensure having them in readiness for work again in the early autumn.

The larger retort-house situated on the east side of the River Skerne was built in 1875, and originally contained 12 beds of five through retorts. In 1889, the benches were rebuilt, and regenerator furnaces adopted; the settings being arranged for twelve beds of seven through retorts each. These have since been converted into twelve beds of eight through retorts; and it is now impossible to further increase the gas-producing power of this house under existing conditions.

The retort-bench in this house has been in use continually for over twenty years, and must of necessity shortly be rebuilt. But it would be false economy to do this; as the unsuitability of the structure, the small space available in front of the retorts, the distance from the coal-stores, and other disadvantages, make it impossible for us to manufacture gas at a lower figure than at present obtains—besides the impossibility of laying this retort-house aside during reconstruction, and making sufficient gas in the old retort-house on the west side of the river to keep the town supplied during the summer months.

With regard to the last-mentioned retort-house, it is quite impossible to remodel this. It only contains eight settings of retorts, part of which have generator fires. It is only a very small building, awkwardly situated in regard to the coal-store—every ton of coal having to be carted from the coal depôts on the east side. There is difficulty in getting the coke away from the retorts into the coke yard, which only covers a very limited area, and is in close proximity to two gasholders. It costs at least 1s. 6d. more to carbonize coal under these conditions than under those existing in the other retort-house, where the conditions are far from ideal, although advantage is taken as far as possible of making use of mechanical methods for handling the coal.

The foundations for the proposed building on the new site were put in some years since; and I am quite convinced that if a thoroughly modern carbonizing plant is erected there, with every facility for the cheap handling of the coal, from the time it arrives in trucks in the overhead siding to the time that the coke is deposited in the coke yard, or into trucks on rail—as we shall have a siding for that purpose—we shall save sufficient in our working costs to pay the increased interest and liquidation charges on the additional capital employed.

We are now handling 40,000 tons of coal per annum, on which I estimate we could save 1s. 6d. per ton, or £3000 per annum, also 20,000 tons of coke, of which at least 8000 tons is put on rail, and on which, with proper facilities for loading, we should effect a saving of 8d. per ton, or £267 per annum. These savings alone would pay the increased interest and liquidation charges resulting from the extensions. But even if this were not the case, the necessity for extending our producing plant must be faced; and this can only be done in a satisfactory manner by erecting an entirely new plant on the lines suggested, at the same time making provision for extensions, so as to avoid the necessity of making any gas in either of the existing retort-houses, and thus centralizing our gas producing plant, which must conduce to more economical working.

Great changes have been made during the past five years in the methods adopted for carbonizing coal, which have resulted in considerably reducing the working costs per ton of coal used; and I shall have much pleasure in bringing the various systems to your notice, as the information obtainable from works where such systems have been adopted will, I am convinced, assure you that we are quite justified in proceeding with the necessary extensions with as little delay as possible.

Patent Block Tar Company.—The "Financial News" says "Sir C. B. H. Soame, the indefatigable Solicitor-Chairman of this Company, is still hard at work circularizing the shares of the concern. A year ago there was a dividend of 150 per cent. on the way. At the moment, however, Sir Charles thinks the nearer probability is that the £1 shares will go to £6. An even greater probability is the prompt repentance of the person who buys them on the chance of it."

LEAMINGTON PUBLIC LIGHTING.

The Watch Committee reported to the Leamington Town Council at their last meeting that they had considered an offer from the Leamington Gas Company and from the Midland Electric Light Company to have two 500-candle power lamps, similar to those referred to in schemes submitted by them, erected in the Tachbrook Road for inspection; and they deferred the further consideration of the matter until after such inspection. After having inspected the specimen street-lamps erected by the Gas Company, the Committee unanimously recommended that their offer to renew the street lighting contract for a period of five years from the 1st inst., at 3d. per 1000 cubic feet less than the price charged to private consumers, and to lay for the improved lighting of the Parade a high-pressure main from the gas-works, to provide 88 high-pressure 500-candle power lamps with inverted burners, and fix the same to the existing columns free of charge, be accepted, together with their further offer to clean, repair, find mantles and glasses for the high-pressure lamps, and keep all lamps in perfect order for a like period for £50 per annum.

In moving the adoption of the report, Mr. Norris pointed out that the Committee had come to a unanimous conclusion with regard to the lighting of the borough. The agreement with the Gas Company expired on Dec. 31; and the Committee asked them for a new tender, and for suggestions with regard to improvements. They also received a tender for lighting on the Parade from the Electric Light Company. After a long discussion, they came to the conclusion, having seen the new lamps placed for their inspection, to recommend that the Gas Company's offer be accepted. What did this offer mean? It meant that the agreement would be for five years instead of three, because of the large expense that the Company would be put to in laying down mains for the high-pressure gas. Though the total cost was considerable, they would have two or three times as much light; and the Company would reduce the charge to the Corporation by another 1d. per 1000 cubic feet as compared with the charge to the private consumer. Thus for the next five years they would have their gas for 3d. per 1000 feet less than the private consumer was charged. With regard to high-pressure gas lighting, those who were acquainted with the system in London, Birmingham, and other large cities, would know that it was about the best that had ever been provided; and, personally, he thought that if they agreed to confirm the report of the Committee, they would have a better light from the works to the top of the Parade than any other town of the same size. The present lamps, he believed, were about 50-candle power, and some of the standards had two and others three burners. They intended to have two lights on each of the standards up the centre of the Parade, and each of these would be of 500-candle power—giving 1000-candle power for each standard. The illumination he considered would be a good advertisement for a residential town like Leamington. The Company were going to provide 88 new lamps at a cost of £3 or £4 each, with inverted burners, which would be much better than the present ones; and the Company would guarantee the light. There was a doubt in the minds of some of the Committee whether with the high-pressure gas there would not be more breakages of glass and mantles; but the Company had offered to keep the whole of the lamps in order, find mantles, and clean the lamps for £50 a year. The Surveyor said this would mean economy. The only thing that could provide cause for objection would be the special lighting of the Parade, which might provoke jealousy in other parts. The Committee considered, however, that they should give the system a trial in the main street first; and, if it was found a success, they would do what they could in other parts of the town, as funds allowed.

Congratulations to the town were offered by Mr. Cashmore upon the way in which the Gas Company had treated them, as they would have a very good advertisement in the new lights, which would be put up without any extra cost to the ratepayers. Mr. England also complimented the Committee upon the steps they had taken with regard to the lighting of the town. Mr. Sheen, however, remarked that he would like to see the generosity of the Gas Company extended to the private consumers; while Mr. Hicks said it was nothing but absurd nonsense to talk, as some members had done, about the so-called generosity of the Gas Company. He should be extremely surprised to find that, as a result of this act, the dividends of the shareholders had been affected. Here they had two monopolies supplying light, one the Gas Company and the other the Electric Company; and this matter was merely a bid for popularity to hold the lighting of the town for another five years against the Electric Light Company. There was just one point, he continued, in regard to lighting. It was perfectly easy to light a street either by gas or electricity, by the most modern methods, for a day or a week. Apparently it was to be left to the Gas Company to say when the mantles were to be replaced; and it was well known to every one of them that the trouble with the mantles was that they lasted for about a week, and not much longer, and within two or three weeks' time the power of light was reduced by one-half. What they wanted was some sort of an assurance that if the lights were to be kept upon a five years' agreement, the mantles should be changed at the discretion of the Watch Committee. Then the Corporation would have some sort of control over the lights and the mantles.

Replying to the latter remarks, Mr. Norris said the Gas Company had given them an assurance that the lights would be properly attended to. As for the lighting of other streets, this would be proceeded with as soon as they could see their way clear, and if the Parade lighting proved a success, which he believed it would.

The report was then passed.

South Hants Water-Works Purchase.—The statutory meeting of ratepayers was held in the Guildhall, Southampton, last Tuesday, to consider the proposed application to Parliament by the Corporation for authority to purchase the undertaking of the South Hants Water Company. The Mayor (Colonel Bance) presided. After the matter had been discussed for three hours, a show of hands was taken on the question of proceeding with the Bill. The voting for and against was very close; but the Mayor decided that the motion put to the meeting had been carried.

PETERSFIELD AND SELSEY GAS COMPANY.

Committee of Investigation Appointed.

A Special General Meeting of this Company was held at the Institute of Chartered Accountants, Moorgate Street Place, E.C., on Monday last week, for the purpose of considering the Provisional Order applied for to empower the Company to raise more capital, and for other purposes. Mr. R. BARNES presided. We are indebted to a long report in the "Financial News" for the following particulars of what took place at the meeting.

The CHAIRMAN explained that the proposed application was for authority to raise capital not exceeding £10,000; and the meeting had been called so that the sanction of shareholders might be obtained. In the event of it being withheld, the costs incurred in respect of Board of Trade fees would be lost. He pointed out that, should the Board of Trade grant the application, no additional capital could be obtained by the Directors until the sanction of shareholders had been given at a further meeting; and it would be left for them to decide what portion of the £10,000 should be preference and what ordinary capital. The view of the Directors was that £1500 in preference shares could be offered for subscription. Judging from the past experience of the Directors, he did not think much trouble would be experienced in securing the greater portion of this sum from the existing preference shareholders. A suggestion had been made that the Company should be wound up; but this would be suicide. It was necessary that further capital should be obtained; and if £1500 were raised in preference shares, it would be applied in payment of the dividend. The position of the existing shareholders would not be prejudiced by raising the £1500, but rather improved. If the application was to be proceeded with, the sanction of the shareholders must be obtained at once.

Mr. W. MOOR said there was no doubt that the Company was over-capitalized; and he attributed this largely to the late Engineer and to the action of those Directors who followed him. In the course of the past two years, however, they had called in a smart and capable Engineer, who had done much to strengthen their position.

Mr. H. J. MITCHELL moved—"That this meeting of shareholders disapproves entirely of the proposal to raise further capital of the Company, and desires that the application to the Board of Trade for this purpose be not further proceeded with." He said he had gone closely into the affairs of the Company, and it would perhaps be inadvisable to give the result of the investigation. He contended that the meeting should have been called before application was made to the Board of Trade; but apparently the Directors were of opinion that they could get the scheme through without calling the shareholders together. Not only was the question as to capital a vital one, but should the resolution be not passed, the present Directors, if they preserved any self-respect, must resign. If they did not, it was his intention to invite the shareholders to meet and deal with the position. The Company was formed by Mr. Preston; and he had information in his possession which would alarm them, having regard to certain circumstances which he would not disclose. The outlook for those concerned, from the debenture-holder down to the ordinary shareholder, was not a happy one. Having referred to the observations repeatedly made by the Auditors on the Company's accounts, he asserted that from the beginning the Directors had acted with Mr. Preston. In criticizing the Board, he wished to exclude the name of Mr. Clayton—a gentleman who was responsible for the appointment of their present Engineer (Mr. T. E. Pye, of Chichester). It would, he considered, be prudent to stop the expenditure of further capital. The Board must be reorganized; but in the interim it would perhaps be as well for the shareholders to appoint someone to look after their interests.

Mr. PRESCOTT expressed the opinion that the resolution did not go far enough. If Mr. Mitchell would accept an *addendum* to the effect that a Special Committee of Investigation should be appointed, with power to call in expert assistance to examine into the working and financial basis of the Company, he would be pleased to support him. The last statement of accounts disclosed a very disastrous condition of affairs. In his opinion, the Directors had exposed themselves to very severe censure for the eminently unsatisfactory position in which they found themselves.

Mr. COLBORN said there should be no winding-up of the Company; but the management should be entirely re-arranged.

The motion was then seconded and carried unanimously.

Mr. Barnes thereupon vacated the chair, which was taken by Mr. Mitchell; and a Committee of Investigation was appointed, with power to call in expert assistance, to examine the working and financial basis of the Company.

ELECTRIC WIRE DANGERS.

Drapers' Chamber of Trade Investigate the Subject.

Towards the close of the week preceding Christmas, two outbreaks of fire occurred in High Road, Leytonstone. They were quickly put out, and nothing more was thought of the matter. Curiously enough, on the morning of the 23rd of December, trouble was caused at the neighbouring drapery establishment of Mr. Henry Spokes by the flooding of the basement. Investigation revealed the fact that the water-pipes had been melted in several places, and that for about 24 hours water had been leaking from them, to the serious detriment of the stock and fittings. According to the "Drapers' Record," to which we are indebted for the foregoing particulars, the cause of all this trouble was a defective electric wire; and if the escaping current from it had acted upon the gas-pipes instead of upon those supplying water, Mr. Spokes considers there would have been little chance of saving his premises from destruction by fire. In conversation with a representative of the publication named, he advanced the theory that many mysterious fires had been due to the action of stray currents.

The loss sustained by Mr. Spokes was considerable; and his case has been taken up by the Drapers' Chamber of Trade, who instructed an expert to investigate the matter. He did so; and the following report by him appeared in the issue of our contemporary for the 7th inst.: "I found Mr. Spokes's stock and premises had suffered considerable water damage, due to the melting of a water-supply pipe caused by fusion of the electric mains. This fusion took place under the pavement outside Mr. Spokes's premises, about 40 feet from the

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 147.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,863	Stk.	Oct 14	5	Alliance & Dublin Ord.	80–83	..	6 0 6
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	94–96*	..	4 3 4
200,000	5	Oct. 28	7	Bombay, Ltd.	6⅞–7	+⅛	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5–5⅛	+⅛	5 1 10
50,000	10	Aug. 31	15	Bourne-mouth Gas & Water	10 p.c.	..	5 1 8
311,810	10	,,	7		B 7 p.c.	..	4 3 7
75,000	10	,,	6		Pref. 6 p.c.	..	3 18 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated		+1	4 17 3
330,000	,,		9⅜	Do. New	196–199	+1	4 15 6
50,000	,,	,,	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	98 100	..	4 0 0
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	214–221	+1	4 19 7
246,320	,,		8	Do. A Ord. Stk.	158–161	..	4 19 5
460,000	20	Sept. 29	10⅝	British	44–45	..	4 14 5
109,000	Stk.	Aug. 11	6	Bromley, A 5 p.c.	119–121	..	4 19 2
165,700	,,	,,	4⅜	Do. B 3½ p.c.	89–91	..	4 18 11
82,278	,,		5⅜	Do. C 5 p.c.	109–111	..	4 19 1
55,000	,,	Dec. 30	3½	Do. 3½ p.c. Deb.	83–85	..	4 2 4
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	95–97	..	4 2 6
100,000	10	—	—	Cape Town & Dis., Ltd.	3–4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	5–6	+⅛	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	88–90	..	5 0 0
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	109½–111½	..	4 9 8
1,513,280	Stk.	,,	5⅛	Commercial 4 p.c. Stk.	110–113	+3	4 12 0
560,000	,,	,,	5	Do. 3½ p.c. do.	104–107	+3⅜	4 13 6
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77–79	..	3 15 11
800 000	Stk.	,,	4	Continental Union, Ltd.	88–91	+1	4 7 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	134–136	..	5 2 11
492,270	Stk.	—	5½	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104–105	..	3 16 2
148,995	,,	Oct. 14	5	East Hull 5 p.c. Ord.	103–105	..	4 15 3
486,090	10	July 14	12	European, Ltd.	24–24½	+½	4 18 0
354,060	10	,,	12	Do. £7 10s. paid	18–18½	+½	4 17 3
16,179,445	Stk.	Aug. 12	4⅝	Gas light and Coke	4 p.c. Ord.	..	4 7 2
2,600,000	,,	,,	3⅜		3½ p.c. max.	..	3 19 7
4,062,235	,,	,,	4		4 p.c. Con. Pref.	..	3 16 2
4,531,705	,,	Dec. 15	3		3 p.c. Con. Deb.	..	3 15 0
258,740	Stk.	Sept 15	5	Hastings & St. L. 3½ p.c.		..	5 5 3
82,500	,,	,,	6⅛	Do. do. 5 p.c.	114–116	..	5 12 1
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17–17½	..	6 5 8
131,070	Stk.	Sept. 15	7⅜	Ilford A and C	146–149	..	4 19 0
65,780	,,	,,	5⅜	Do. B	115–117	..	5 0 5
63,300	,,	Dec. 30	4	Do. 4 p.c. Deb.	95–98	..	4 1 8

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	Nov. 11	9	Imperial Continental	185–187	..	4 16 3
1,235,000	Stk.	Aug 12	3⅜	Do. 3½ p.c. Deb. Red.	94–96	..	3 12 11
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	121– 23	..	4 17 7
561,000	Stk.	,,	10	Liverpool United A	220–222	..	4 10 1
718,100	,,	,,	7	Do. B	164–165	..	4 4 10
306,083	,,	Dec. 30	4	Do. Deb. Stk.	102–104	..	3 16 11
75,000	5	Dec. 15	6	Malta & Mediterranean	4⅜–4¼	..	6 3 1
560,000	100	Oct. 1	5	Met. of Melbourne	5 p.c. Deb	..	4 18 0
250,000	100	,,	4½		4½ p.c. Deb.	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd.	12½–12⅝	..	5 9 10
1,775,892	Stk.	July 28	4⅜	Newc'tle & G'tesh'd Con.	102–103	+½	4 5 0
529,435	Stk.	Dec. 30	3⅜	Do. 3½ p.c. Deb.	89–90	..	3 17 9
55,940	10	Aug. 31	7	North Middlesex 7 p.c.	139–141	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	137–139	..	5 14 1
60,000	5	Sept. 15	8	Ottoman, Ltd.	6⅞–7⅛	..	5 18 6
31,800	53	Aug. 31	13	Portsea Island A.	133–135	+1	5 1 8
60,000	50	,,	13	Do. B.	126–128	+1	5 1 7
100,000	50	,,	12	Do. C.	119–121	+1	4 19 2
114,800	50	,,	10	Do. D and E.	103–105	..	4 15 3
398,490	5	Oct. 28	7	Primitiva Ord.	7⅞–7⅞	..	4 13 4
796,980	5	Dec. 30	5	Do. 5 p.c. Pref.	5⅛–5⅜	+⅛	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	95–97	..	4 2 6
312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	95–97	..	4 2 6
250,000	10	Sept 29	9	San Paulo, Ltd.	15⅜–15⅝	..	5 14 3
115,000	10	,,	6	Do. 6 p.c. Pref.	11½–12	+½	5 0 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50–51	..	4 18 0
135,000	Stk.	Aug. 31	10	Sheffield A	229–231	..	4 6 7
209,984	,,	,,	10	Do. B	229–231	..	4 6 7
523,500	,,	,,	10	Do. C	229–231	..	4 6 7
70,000	10	Oct. 14	6	South African	10⅜–11⅛	..	5 6 8
6,429,895	Stk.	Aug. 12	5/9/4	South Met., 4 p.c. Ord.	121–123	..	4 8 10
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	78½–80½*	..	3 14 6
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	155–157	..	5 1 1
605,000	Stk.	Aug. 12	5⅜	S'th Suburb'n Ord. 5 p.c.	120–122	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	120–122*	..	4 2 0
502,310	Stk.	Nov. 11	5	Southampton Ord.	110–112	..	4 9 3
120,000	Stk.	Aug. 12	7	Tottenham and Edmonton	A 5 p.c.	..	4 17 11
483,940	,,	,,	5⅜		B 3½ p.c.	..	4 15 8
149,470	,,	Dec. 15	4		4 p.c. Deb.	..	4 2 6
182,380	10	Dec. 30	8	Tuscan, Ltd.	9–9½	+½	8 8 6
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	97–99	+1	5 1 0
236,476	Stk.	Aug. 31	5	Tynemouth, 5 p.c. max.	114–115	..	4 6 11
255,636	Stk.	Aug. 31	6¾	Wands-worth	A 3½ p.c.	..	4 13 7
85,766	,,	Dec. 30	3		3 p.c. Deb. Stk.	..	4 0 0

Prices marked * are "Ex. div."

meter, and, therefore, quite out of his control. When the fusion took place, the current was carried along the water-pipe up to and along the first-floor level for a distance of 40 feet, finally running to earth along the steel girder; sections of the pipe, varying from 3 to 7 feet in length, and aggregating 22 ft. 6 in., being melted practically away. In my opinion, the primary cause was a defect in the insulation of the cable, which I understand is only protected by steel conduit instead of being passed through earthenware pipes, which is usually done. Probably the steel tubing became 'live' through the faulty insulation, and thus carried the current to the water-pipe. Mr. Spokes has seen the Electric Supply Company, who say the accident must have been caused by the Water Company placing their pipe against the cable. But the Water Company maintain there is no water-pipe within 2 feeet of the cable. Mr. Spokes informs me that the Electric Supply Company admit that there has been a leakage of current; but they decline to acknowledge any liability with regard to damage done by it. Other premises in close proximity to the above have been affected in a similar manner—in one case at least followed by fire, which was fortunately extinguished by first-aid appliances. From this it would appear that the Electric Supply Company are at fault; for if the cables had been properly insulated, it would have been impossible for contact to have been made with the water-pipe."

Our contemporary reproduced a photograph taken of the pipes; and they have the appearance which pipes affected by electrolysis present, and with which most of our readers are familiar. They are thick lead pipes; and, being full of water, they must have been subjected to very great heat before they melted.

It is stated in the number of our contemporary for Saturday last that in the new electric lighting installation on the premises of Messrs. Arding and Hobbs, the Clapham drapers who suffered from a disastrous fire about a year ago, every precaution has been taken to give immediate notification of escaping current, and convey it safely away. Every inch of wire is protected by steel barrel, screwed at the joints, and earthed.

Last Friday, fire caused by a short-circuit broke out in the lift of the Grand Hotel Continental at Montreux, and completely destroyed the roof. A number of people staying in the hotel, which was nearly full, had to be rescued from their rooms by way of the roof when the alarm was given. Fortunately the fire was soon got under control. One member of the staff and a chambermaid sustained slight injuries.

Charge for Water for Shipping at Liverpool.—A deputation has waited on the Water Committee of the Liverpool City Council to urge a reduction in the charge for water supplied to ships; and the Committee promised to give the request careful and sympathetic consideration. It seems that for water required for the use of ships the Corporation charge 2s. 6d. per 1000 gallons, as compared with a rate of 4d. to railway companies and 6d. for factories. Shipowners are unable to find a reason for this great difference in the treatment of various sets of consumers.

OIL CARRIAGE AT MANCHESTER.

A Special Sub-Committee of the Manchester Corporation Gas Committee have for some time had under consideration the question of how to improve upon existing arrangements for the conveyance from the storage station at Mode Wheel on the Ship Canal to the Bradford Road Gas-Works of the oil used in the manufacture of carburetted water gas. Last Thursday saw the inauguration of a new system carried out in the presence of members of the Gas Committee, headed by the Chairman (Alderman Gibson).

It has been the practice hitherto to convey the oil from Mode Wheel to the gas-works by road in motor tank-waggons, holding about 6 tons each; but the use of these waggons has resulted in the receipt of many complaints from residents on the route, owing to the vibration, in addition to which there was the wear and tear of the roads, and the cost of handling the oil, of which about 10,000 tons are consumed per annum. Now the oil is to be taken from the storage tanks at Mode Wheel to the gas-works by the Bridgewater Canal, in large tank steamers. The Gas Committee witnessed the pumping of the oil from the storage tanks into the "Pioneer," the first of a fleet of boats constructed for the purpose, each having a holding capacity of about 60 tons. By the new method, the Committee anticipate a saving to the rates of some £300 a year, besides doing away with complaints arising from the use of the old motor tank-waggons. The oil used by the Gas Department is brought from abroad in cargoes of from 2500 to 3000 tons, and discharged direct into the storage tanks at Mode Wheel. Under the new arrangement, it will be loaded into boats on the canal by gravitation, and thence conveyed to a point near the Bradford Road Gas-Works, where it will be discharged into pipes leading direct into the works.

Abstraction of Water from the Thames.—At the invitation of the Hon. T. H. W. Pelham, C.B., Assistant-Secretary to the Harbour Department of the Board of Trade, and Mr. F. J. Willis, Assistant-Secretary to the Local Government Board, Lord Desborough, Chairman of the Thames Conservancy Board, and Mr. E. B. Barnard, Chairman of the Metropolitan Water Board, and a deputation of the two bodies, met at the offices of the Board of Trade last Tuesday, and, so far as the representatives of the two bodies were concerned, the preliminary basis of an arrangement satisfactory to both parties was arrived at in connection with the future abstraction of water from the Thames to meet the increasing needs of the Metropolis, for which the Conservators have asked for an adequate payment. The effect of the arrangement will be that the litigation at present pending between the two bodies may ultimately be withdrawn, and many matters which for some years have been in dispute may be amicably settled. The result of the conference will be reported to the Thames Conservancy and the Water Board at their next meetings.

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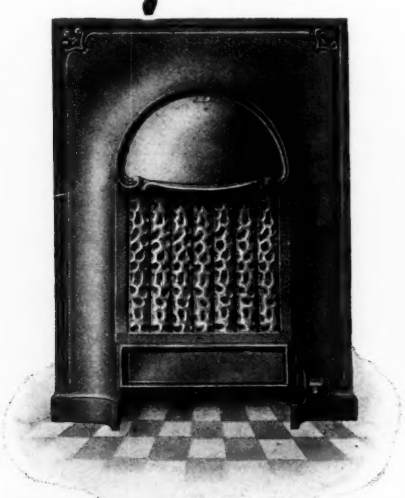

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WORKSOP WATER ARBITRATION.

At the Surveyors' Institution, Great George Street, Westminster, last Tuesday, arbitration proceedings were opened to determine the price to be paid by the Worksop Urban District Council for the undertaking of the Worksop Water Company, under the Act sanctioning the purchase obtained by the Company last year. Mr. F. Fowler and Mr. E. Willcox were Arbitrators for the Company and Council respectively; and Mr. A. J. Ram, K.C., was the Umpire. Mr. Honoratus Lloyd, K.C., and Mr. Courthope-Munroe appeared for the Company; Mr. Wedderburn, K.C., and Mr. Keen represented the Council. The Company's estimate of the worth of their undertaking was £87,057; and they were dependent for this amount on the valuations of Mr. E. M. Eaton, M.Inst.C.E., Mr. W. Terrey, the General Manager of the Sheffield Corporation water undertaking, the examination of their accounts made by Mr. Cash, and the evidence of their staff. On the other hand, the Council produced as witnesses Mr. J. Diggle, Mr. Silcock, Mr. Keen, and the Borough Surveyor (Mr. G. Rawson) to prove that £48,927 was a fair price to be paid for what they held to be a 4 per cent. investment. The inquiry lasted till Saturday, when it was left to the tribunal to decide whether or not the Council shall acquire the undertaking in March or June of the current year. If it is considered essential, for the purposes of the award, to test the capacity of the wells, the transfer cannot take place until June.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A very instructive paper on "Gasholder Construction" was read to-night by Mr. J. Taylor, of Glasgow, at the monthly meeting of the Scottish Junior Gas Association—Western District. As was stated by the President, few men have had so much experience in the erection of gasholders as Mr. Taylor, who has acted as inspector for the Corporation during the erection of the large gasholders in Glasgow. His paper was full of detail upon the metal work of the holders. The information was so complete, and experience in the erection of gasholders so novel, that there was scarcely any expression of opinion by the members. They will, however, benefit by the communication.

The arbitration in the Kirkcaldy gas transfer, which has been the great event with us in Scotland this week, proceeds slowly. Four days have been occupied, and all that has been accomplished has been the examination of three witnesses and a visit to the gas-works. Everyone I have met is remarking upon the excellent appearance which Mr. A. Macpherson (at one time the Manager, now the Chairman, of the Gas Company) has made. On three of the four days he was in the witness-box; and he stood the ordeal in a way which would have done credit to one of much less advanced years. Of course, Mr. Macpherson is acquainted with the subject to a degree which no one else is or can be; and his examination shows how completely he has every detail in the history of the Company, and in its administrative policy, at his finger-ends. The arbitration is to proceed again on Friday next. It is anticipated that three days will be available; and the probability is that this will be sufficient for the hearing, as the witnesses who are yet to come cannot occupy so much time as has been required by those who have opened the case for the Company. The proceedings from now onwards would have been taken in London, where the members of the tribunal and nearly all the witnesses reside; but Mr. Clyde, K.C., the senior Counsel for the Corporation, has engagements in Edinburgh on the evenings of the days fixed, so the hearing is to be continued in that city. In the course of the proceedings, reference was made to the illness of Mr. J. Kincaid, the Manager of the Company; and it may be as well to state that Mr. Kincaid has been, very unfortunately, laid aside at this most inopportune moment by an attack of appendicitis. He has undergone an operation; and his friends will be pleased to learn that he is progressing favourably.

There was submitted to the Hamilton Town Council on Tuesday a report by the Manager—Mr. J. Ballantyne—which was the outcome of an inquiry at the last Council meeting as to the capital charges for the coal-handling plant, as against the saving of £246 in wages then reported. Mr. Ballantyne's report was to the effect that any information at the present time could only be estimated. The drawing-machine did not come into regular operation till the beginning of October; and he thought it would be advisable to wait till the end of the financial year, when they would have a better idea as to how the whole plant was going to work, and the actual saving could be ascertained. During the last financial year, the other parts of the plant were in operation for about six months only, taking into account the breakdowns and delays which naturally occurred with all new plant; so that any reliable data they had were for very limited periods. It might be stated, however, that till the end of the last financial year the total cost of the siding and plant had been £7383, and that £2000 of this had been repaid; leaving a balance of £5383. To this there fell to be added £1003 expended since May 15 last, and there was a balance still due of £137; making the total cost of the siding and plant £9023, which was £1008 more than the estimate. As the Committee were, however, already aware, the siding was responsible for about £600 of this extra amount, and the balance was due to the electric capstan, ammeters, electric wiring, and extra foundations required in the retort-house for the coal-bunker supports. To pay interest this year will require about £225, and the charge for electricity would be about £90; making a charge of £315 against the plant. The annual charge for interest would decrease £37 10s. as each £1000 was paid off. There would be a saving in cartage, due to the siding, of £520; and should the plant continue working as at present, the saving in wages for this year will be about £700. There will be a further saving in the extra gas obtained from the coal, and also in benzol; but these could not at present be definitely ascertained. The Gas Committee, in submitting

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Mr. Ballantyne's report, agreed that a fair comparison could not be made, as the plant had not been working for the full period. The Gas Committee reported that a proposal had been made to them that an official opening of the new plant should be held, but that the Committee had not entertained the proposal. Bailie Anderson, the Convener of the Committee, moved that this part of the minute be not adhered to. In the course of the discussion, several motions were proposed; and in the end, one was adopted approving of the resolution of the Gas Committee that there should be no formal opening ceremony, but adding that the Council would be pleased, when the Institution of Gas Engineers meet in Glasgow, to give them every facility to see the new works.

At a meeting of the Lighting Committee of the Dundee Town Council on Tuesday, Mr. Neave, the Convener, asked that the Gas Manager be given power to experiment with automatic lighting and extinguishing apparatus for the street-lamps. Mr. A. Yuill, the Manager, said that several cities had gone in for it. One of the chief items in the cost of street lighting was the labour required. If Dundee had been built on flat ground, the question would have been comparatively easy, but the difference in the levels introduced difficulties; and he wished for power to experiment. The Committee granted permission.

The Town Council of Inverurie, having discussed in Committee the procedure to be adopted in the proposed gas transfer, this week reported to themselves in open Council recommending that a deputation of their number should be sent to confer with the Directors of the Gas Company on the subject. The recommendation was adopted.

In the Wick Town Council on Monday, Mr. Simpson suggested that the Council should ask the Gas Company for a reduction in the price of gas for the street-lamps. It was pointed out that the rate had been reduced from 6s. 8d. to 5s. 2½d. per 1000 cubic feet in two years; but the Council agreed to ask a further reduction. Mr. Sutherland suggested the Council should consider the advisability of municipalizing the gas supply.

The question of giving discounts to gas consumers was considered and decided by the Arbroath Town Council on Monday. On the advice of the Convener and the Manager, the Gas Committee recommended that a rebate of 2½ per cent. be allowed upon all quantities of gas consumed between 50,000 and 500,000 cubic feet per annum; and that for all quantities above 500,000 cubic feet per annum a rebate of 5 per cent. be allowed. It was further recommended that the price of gas for power purposes be 2½d. per 1000 cubic feet less than that to ordinary consumers, and that a further allowance of 2½d. per 1000 cubic feet be allowed to consumers using upwards of 250,000 cubic feet per annum for power; also that the discounts allowed to ordinary consumers for large quantities apply to gas used for power, in addition to the lower price stated. It was explained that the effect of these discounts would be a concession to consumers of about £110 per annum. The number of consumers who would benefit by the concession would be about 150, the total gas consumed by whom is equal to some 24⅓ million cubic feet per annum, or about 25 per cent. of the total gas sold. Provost Alexander moved the adoption of the recommendations. As the discounts had not been agreed to when the estimates for the current year were prepared, the Gas Committee were agreed that they could not take effect until after the end of the current year on May 15 next, and, further, that as it was not possible to ascertain the annual consumption in each case until after the last quarter of the year, the Committee were of opinion that the discount should take the form of a rebate after the indices for the last quarter had been read, immediately before May 15; and the first discounts to be given would therefore be in the last quarter of 1911-12. Mr. Chapel said he quite agreed to the rebate being given, but he asked if they had power to do it under the Act. Bailie Smith, the Convener of the Gas Committee, replied that other Corporations were doing the same. In the case of prepayment meters, they allowed a rebate; and they had never been called in question. The recommendations were agreed to.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 187.]

LIVERPOOL, *Jan.* 14.

Sulphate of Ammonia.

Although the present level of prices is the highest attained for the past fifteen years, the strength of the market continues unabated, and a good business has been done in the course of the week at a further advance in values. Some consumers, who have been delaying their purchases in the hope of buying at less money, have stimulated the tone by deciding to provide for their early requirements now; and at the close the quotations for prompt delivery have reached £13 3s. 9d. to £13 5s. per ton f.o.b. Hull, £13 5s. to £13 6s. 3d. per ton f.o.b. Liverpool, and £13 7s. 6d. to £13 8s. 9d. per ton f.o.b. Leith. In the forward position, sales are reported at £13 5s. per ton f.o.b. at the best ports, for delivery up to April next. Manufacturers have now raised their ideas for the early months to £13 10s. per ton f.o.b. Leith, but buyers refuse to follow them.

Nitrate of Soda.

The market for this article continues very firm at 9s. 6d. per cwt. for 95 per cent. and 9s. 9d. for refined quality, on spot.

LONDON, *Jan.* 16.

Tar Products.

The markets for tar products have all been good throughout the past week. Pitch has been very firm, and sales are reported on the east coast at 38s. to 38s. 3d. per ton for delivery not only for January-June, but also all over the present year. In London, there is little or none for sale, and makers are asking 38s. to 39s., according to delivery. On the west coast, it is stated that 37s. 6d. has been paid in Manchester; while in Glasgow, this price was paid early last week f.a.s. Clyde,

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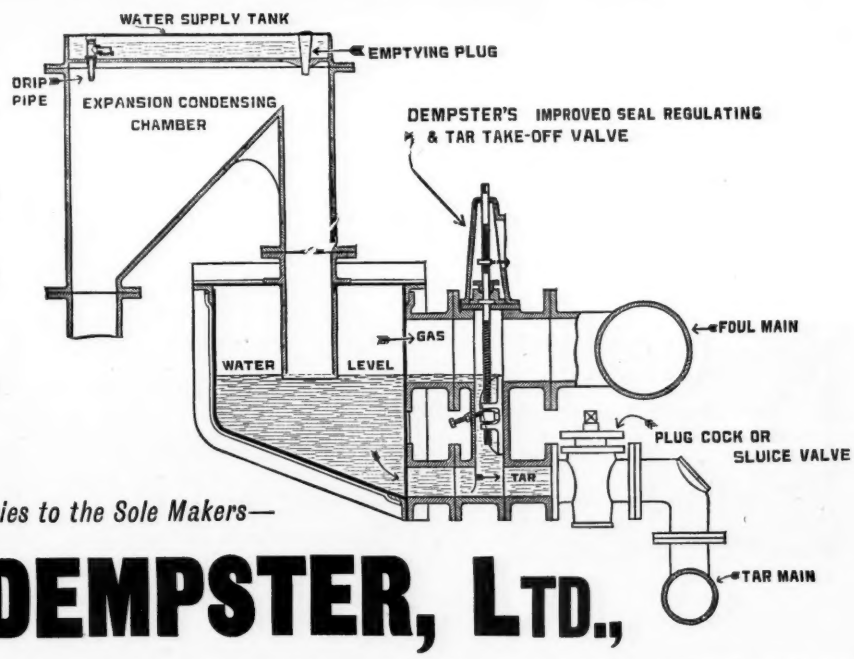

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but since then higher prices are reported to have been paid. Benzol 90 per cent. is very firm for delivery over the next two or three months of this year only. With regard to delivery all over the year, there does not appear to be so much desire to purchase. Fifty-ninety per cent. benzol is steady. Solvent naphtha is quiet. Heavy naphtha is fetching good prices, though there is not very much demand for it. Carbolic acid is steady. Cresylic acid is very firm indeed. Naphthalene is quiet; and salts are in good demand. Tar is still realizing good figures.

Owing to a clerical error, the top value of tar in last week's report was given as 23s. 3d. instead of 22s. 3d.

The average values during the week were: Tar, 18s. 9d. to 22s. 9d., *ex* works. Pitch, London, 38s. to 38s. 6d.; east coast, 37s. 6d. to 38s. 6d.; west coast, Clyde, 37s. 6d. to 38s. 6d., Manchester, 37s. 6d. to 38s., Liverpool, 38s. to 38s. 6d. Benzol, 90 per cent., casks included, London, 8¾d. to 9d.; North, 8½d. to 9d.; 50-90 per cent., casks included, London, 8½d. to 8¾d.; North, 8¼d. to 8½d. Toluol, casks included, London, 9½d.; North, 9d. Crude naphtha, in bulk, London, 3⅞d. to 4⅛d.; North, 3d. to 3¼d.; solvent naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d.; heavy naphtha, casks included, London, 11⅜d. to 1s.; North, 11d. to 1s. Creosote, in bulk, London, 2 5/16d. to 2 7/16d.; North, 1⅞d. to 2d. Heavy oils, in bulk, 2⅜d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 1½d.; west coast, 1s. 1d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 45s., bags included. Anthracene, "A" quality, 1⅛d. to 1⅜d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article has been very firm indeed during the past week, and prices have a general tendency to advance. The Gas Companies are now asking £12 17s. 6d. for 25 per cent. stuff; while for outside London makes £12 15s. is asked. In Hull, the quotation closed at £13 3s. 9d. to £13 5s.; and in Liverpool, £13 5s. to £13 6s. 3d. In Leith, £13 8s. 9d. to £13 10s. is asked; £13 7s. 6d. having been refused at this port late in the week. Middlesbrough closes at about £13 6s. 3d. to £13 7s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

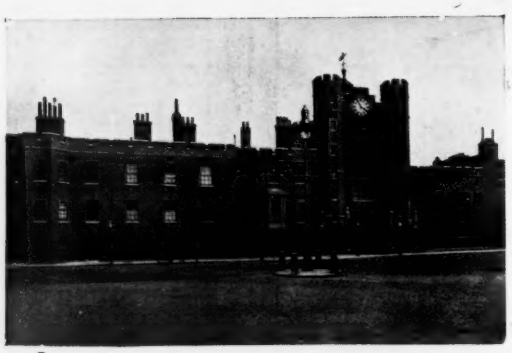
There is more activity in the coal trade, except where the stormy weather interferes with shipment. In the steam coal trade, the demand has caused prices for prompt shipment to advance, and about 9s. 9d. to 10s. 3d. per ton f.o.b. is the current price. For second-class steams, about 8s. 6d. is quoted; and for steam smalls, from 5s. to 6s. 6d. Work at the collieries is now about normal, and the output is well taken up. In the gas coal trade, the demand is still very heavy, and is likely to continue so for some weeks to come. Durham gas coals vary in price, according to quality. The usual classes are from 8s. 6d. to 9s. 4½d. per ton f.o.b.; while for "Wear specials," from 10s. 6d. to 10s. 9d. is the current quotation. There are contracts in the market for Scandinavia and Russia; and it is expected that the smaller of these will be placed with Durham collieries for "special" gas coals at figures somewhat near the current prices. Other contracts are in the market; but some of the best collieries now appear to be better placed, and are firmer in their quotation for forward delivery. Coke is steady. Though the production of gas coke is now very full, it seems to be fairly taken up, and for good quality from 14s. 6d. to 15s. per ton f.o.b. is asked.

Scotch Coal Trade.

Home demands have not changed; but the foreign request, except for splint, has fallen off considerably. Small sorts were long a drug in the market, but are now finding a ready sale. The prices now quoted are: Ell, 9s. 9d. to 10s. 3d. per ton f.o.b. Glasgow; splint, 10s. 6d. to 10s. 9d.; and steam, 9s. to 9s. 3d. Shipments for the week amounted to 149,448 tons—a decrease of 209,306 tons upon the preceding week, and of 2091 tons upon the corresponding week last year.

A Water Board Surcharged.—The Conway and Colwyn Bay Joint Water Board have been surcharged in various amounts by the District Auditor of the Local Government Board. An item of £12 disallowed is part of a sum of £23 15s. 3d. spent in connection with a visit of 43 people to Cowlyd Lake, for which the Auditor considered £11 15s. 3d. sufficient to cover expenses. The matter has been under consideration by the Local Government Board, and they have remitted the disallowance, though with considerable hesitation, having regard to the large number of persons who took part in the visit. The Board say that if, in future, it is found necessary to make another visit, they would suggest the appointment of a small Committee.

Paignton Water Bill.—A meeting of the ratepayers of Paignton held yesterday week unanimously approved of the proposal of the District Council to promote a Bill in Parliament for the improvement of the water-works. Mr. F. Sarson, the Chairman of the Council, explained that the object of the Bill was to enable them to duplicate the trunk main, and also to provide for the extension of the period for the repayment of the loan from thirty to sixty years. Mr. W. J. Ham, the Chairman of the Water Committee, said that £65,639 had been borrowed for water purposes; the period of repayment being fixed at thirty years. The estimated cost of duplicating the main was £27,000. If they could get the period for repayment of the original loans extended to sixty years, and also have this period allowed for the payment of the cost of the main, the amount of the sinking fund for all water-works purposes would be £1502 instead of £1979 as at present. Against this there would be £1089 as interest on the new loan. But it was anticipated that the additional amount paid by Teignmouth and Brixham for water with a more abundant supply would more than cover this. Mr. F. Vanstone, the former Water Engineer to the Council, while agreeing with the object of the Bill, said he dissented from the details of the scheme. The Bill was discussed by the Teignmouth District Council yesterday week, when it was resolved to ask the Paignton Council to make one or two amendments in its provisions.



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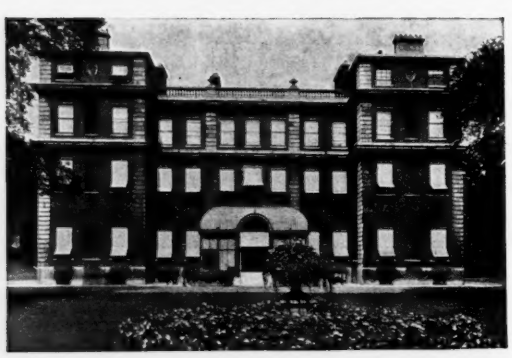

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267.

Electricity Supply Project at Holmfirth.

At a recent meeting of the Holmfirth Urban District Council, a draft circular was read from Mr. Harry Marsden, the Manager of the gas and electricity works of the Honley Urban District Council, who is advising the Holmfirth Council in regard to a proposed scheme of electricity supply. He had prepared it with the view of having it sent to occupiers of houses and business premises in the district, in order to ascertain what measure of support the Council were likely to receive from the ratepayers generally. In the course of the circular, Mr. Marsden submitted for their consideration the following observations in advocacy of electricity: "Electrical energy could be used for general lighting of houses or business premises, for power purposes in numerous instances, for attractive advertising signs, for domestic ironing, and many other domestic and other purposes; and the cost is very reasonable in all cases. As an illuminant, using metal filament lamps with suitable shades, you can obtain a light of 50-candle power at a cost of 1d. for three hours' use, taking the electricity at 6d. per Board of Trade unit; and for the various other purposes electricity is equally cheap. If sufficient customers can be obtained, it will be possible to supply at considerably under 6d. per unit. The advantages of using electricity are many, among them may be named: Cleanliness, convenience, adaptability, no matches or tapers to use, &c." He went on to say he was directed to inform the recipient of the circular that he would shortly be waited upon by a representative of the Council, who would gladly give him any further information he might desire; and if he agreed to take a supply of electricity for any of the purposes mentioned, the necessary form would be supplied for signature. The Council resolved that the draft circular should be adopted; and that the Electricity Committee should arrange as to the number of copies to be printed, the manner of their distribution, and certain other details. We have no desire to criticize the action of Mr. Marsden; but it may be pointed out that in his circular he has not said anything about the cost of wiring premises, fittings, lamps and renewals, meter-rents, &c. Nor has he made any reference to the cost of gas in Holmfirth. As this is now 3s. 1d. per 1000 cubic feet for lighting, 2s. 9d. for cooking, heating, &c., and 2s. 6d. for power, we think the Council will find electricity at 6d. per unit will have a strong competitor.

Alleged Theft of Gas.—The Tunstall (Staffs.) Magistrates last Tuesday committed for trial a man named Peter Ryan, of Tunstall, on a charge of stealing gas from the British Gaslight Company. Defendant's meter was removed as there was a shortage of cash; and subsequently the Company became suspicious that their gas was still being used by Ryan. An inspector therefore visited the place, and saw that gas was being consumed through an incandescent burner. On the meter being disconnected, an iron cap was fixed on to the service-pipe; when the inspector examined the pipe, this cap was found loose—indicating that it had been tampered with. Ryan denied having taken any gas, but said he used lamps. He was, however, unable to produce any. He reserved his defence.

Swansea Corporation and the Gas Company's Bill.—The Swansea Corporation have presented a memorial complaining that the Gas Company have not complied with the Standard Orders in respect of their Bill. As mentioned when noticing the Bill in the "JOURNAL" last week, the Company wish for authority to construct a tramway along certain thoroughfares; and the Corporation submit that their consent, as the road authority, should have been obtained. This has not been done. The Parliamentary Committee of the Corporation have instructed the Town Clerk (Mr. J. Thomas) to take all necessary steps to protect the interests of the Corporation; and a small Sub-Committee has been appointed to negotiate with the Company with a view, if possible, to an amicable settlement of the matters in difference.

The Rural District Council of the Isle of Wight have accepted from Mr. J. A. Ewart, of Westminster, a tender for carrying out a scheme to improve the water supply for Niton, Whitwell, St. Lawrence, and Godshill, at a cost of £5475.

Owing, it is supposed, to mice having gnawed a hole in a gas-pipe, allowing a quantity of gas to collect between the floor and ceiling in a house at Darnall, Sheffield, a few days ago, a serious explosion occurred on an inmate lighting a small gas-stove. Much damage was done to the house; but little personal injury was sustained.

APPLICATIONS FOR LETTERS PATENT.

60.—JOHNSON, J. Y., "Electrical purification of gases." A communication from Badische Anilin und Soda Fabrik. Jan. 2.
78.—BUSSEY, L. E., "Manufacture of gas." A communication from W. E. Evans. Jan. 2.
124.—HARDING, C. K., "Inverted mantles." Jan. 3.
142.—JOHNSON, J. Y., "Electrical purification of gases." A communication from Badische Anilin und Soda Fabrik. Jan. 3.
172.—CHRISMAN, H., "Measuring the flow of fluid." Jan. 3.
184.—GUNNING, J., "Lighting and extinguishing lights." Jan. 4.
212.—HARDING, C. K., "Inverted mantles." Jan. 4.
221.—BELL, J. H., "Joints of pipes." Jan. 4.
245.—WHITEHEAD, R. W. E., "Globes and supports." Jan. 4.
249.—CARDELL, C. C., "Compressing and exhausting gases." Jan. 4.
272.—PARKINSON AND W. & B. COWAN, LTD., and LANGLANDS, S. B., "Street-lamps." Jan. 5.
298.—MOELLER, J., "Oil gas." Jan. 5.
330.—HARRISON, M., "Gas-stoves." Jan. 5.
337.—WHITEHEAD, R. W. E., "Globes and supports." Jan. 5.
341.—WILLIAMS, J., "Air-gas apparatus." Jan. 5.
367.—DIXON, W., "Removal of deposit in pipes." Jan. 6.
382.—MASON, A., "Regenerators." Jan. 6.
428.—HEATON, C., "Incandescent burners." Jan. 6.
464.—BENNINGHOFF, O., and KLÖNNE, A., "Condensers for use in connection with retort and chamber furnaces." Jan. 7.
465.—HÖHLE, W., "Mantles." Jan. 7.

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New Service Reservoir for Manchester.—The service reservoir which the Manchester Corporation are constructing at Heaton Park will hold when completed 500 million gallons of water, equal to twelve days' supply for the whole of the area dependent on Manchester. It will take five years to construct ; and it will be filled with water from Thirlmere.

North Warwickshire Water Company.—An extraordinary general meeting of this Company was held last Thursday, at the Westminster Palace Hotel, S.W., to consider resolutions for removing the Secretary and some of the Directors, and appointing a fresh Board. Mr. R. Barnes presided. Considerable attention was given to a circular which had been issued to the shareholders by Mr. M. J. Jarvis, in which allegations were made against certain Directors. After some discussion on the position of the undertaking, a Committee of Investigation, consisting of five shareholders, was appointed, with power to examine all documents belonging to the Company—their report to be presented at a subsequent meeting.

Reductions in Price.—The Directors of the Elsecar, Wentworth, and Hoyland Gas Company have announced that, as from the 1st inst., the price of gas to ordinary consumers will be 3s. 9d. per 1000 cubic feet, with a discount for prompt payment (21 days) of 5d. for lighting and 9d. for stoves and engines supplied through a separate meter. The old prices, which came into force on Oct. 1, 1906, were 4s. 2d., with discounts of 7d. and 1s. respectively. The reduction is 3d. for lighting and 2d. for stoves and engines. Prepayment consumers will still receive 20 cubic feet for 1d., but will be allowed a discount of 5d. instead of 2d. when meters are found to be correct. As from the end of the current quarter, the price of the Newbridge Company's gas will be reduced 5d. per 1000 cubic feet.

Islington Lighting Costs.—Referring to the reply of Mr. F. W. Goodenough to Alderman Vorley's comparisons of the cost of gas and electric lighting in Islington, as given in the "JOURNAL" last week (p. 109), a correspondent wrote as follows to a local paper : "The reply of the Gas Company really only confirms the observations of the man in the street—viz., that the huge difference of candle power between a gas-lit and the electrically-lit streets claimed by Alderman Vorley simply does not exist, and that all the deductions drawn from this supposed difference are unsound. Whether the Gas Company's figures are accurate or not I cannot, of course, say ; but two facts seem to stand out clearly and beyond dispute—viz., that the gas-lighted streets are lighted well, and, to all appearances at least, as satisfactorily as those lighted by electricity ; and that gas costs £131 per mile annually, while electricity costs £634 per mile."

Manchester Gas and Electricity Departments.—Joint meetings between the Gas and Electricity Committees of the Manchester Corporation are being held, under the presidency of t e Lord Mayor (Mr. Charles Behrens). The object is stated to be to honsider the policies and working methods of each department, and to remove any possible ground for grievance which one may have against the other. For instance, there is a feeling on the part of the Gas Committee that the Electricity Department has been unduly favoured in the past. At the first sitting, Alderman Gibson, the Chairman of the Gas Committee, stated the case for his department, and submitted, among other things, that it was unfair to exact from the gas profits a sum equivalent to 2 per cent. on the capital value of the undertaking, and let the other department off with less than ¼ per cent. Careful note was taken of Mr. Gibson's statement ; and the parties adjourned for the preparation of the case for the Electricity Committee.

Harrogate and Water Loan Repayments.—In the course of a Local Government Board inquiry at Harrogate relative to an application by the Town Council for sanction to borrow £20,250 in connection with the water undertaking, the Town Clerk (Mr. J. T. Taylor) remarked that the Council hoped this sum would complete the Roundhill scheme. The Council asked for a period of sixty years for the repayment of the loan, as they considered thirty-five years too short a time for permanent works. Mr. Barber said that he believed the Board had received a petition signed by 3000 ratepayers urging upon them the importance of at least extending for the Corporation to sixty years the period for the repayment of loans upon their very extensive water-works, which they were now hoping to see completed within a short period. He wished to emphasize the great importance of high rates or low rates in a place like Harrogate, as compared with towns where there were staple and continuous trades all the year round. Mr. Parker spoke on the same lines, and pointed out that they were now paying about £30,000 per annum on sinking fund account, which was a heavy burden. Mr. Nelson said that, as representing the Harrogate Chamber of Trade, his one specific object was to get the time for repayment extended to sixty years.

Messrs. A. E. Podmore and Co., of 34, Charles Street, Hatton Garden, London, E.C., intimate that Mr. S. J. Sewell no longer represents them.

The Scottish Junior Gas Association (Eastern District) will make their third visit of the present session next Saturday to the Fife Coal Company's Bowhill Colliery.

The Simpitrol Lighting Company (Ireland), Limited, has been registered in Dublin with a capital of £1000, in £1 shares, to carry on the business of agents for the purchase and sale of plant, machinery, and accessories in connection with the air-gas systems manufactured and owned by the British and Colonial Lighting Company, Limited, of London.

Reference has been made in the "JOURNAL" on several occasions to a useful little arrangement in the shape of a support for gas-meters, &c., which has been introduced by Messrs. D. Hulett and Co., Limited, of High Holborn. We learn that it has been materially strengthened by the insertion of a groove or corrugation to stiffen the metal of the projecting portion ; and that tests which have been applied to supports made after the improved pattern have been most satisfactory.

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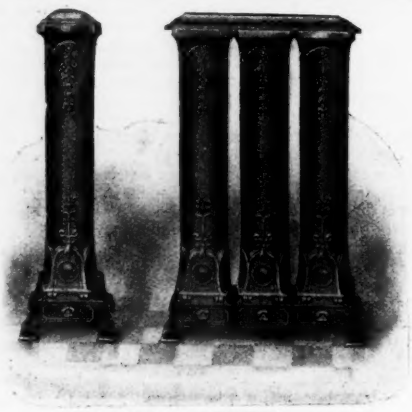

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